UNIVERSITY OF CALIFORNIA PUBLICATIONS

IN

ZOOLOGY

WILLIAM EMERSON RITTER
AND
CHARLES ATWOOD KOFOID
EDITORS

VOLUME 7

WITH 12 PLATES

Smithsonian Institution,
MAY 17 1912
221909
National Museum.

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY
1910-1912

C2C356

CONTENTS

PAGE

1. Two new Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth 1–8

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. With 6 plates and 3 figures in text 9–172

3. An apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor 173–177

4. The Linnet of the Hawaiian Islands, a Problem in Speciation, by Joseph Grinnell 179–195

5. The Modesto Song Sparrow, by Joseph Grinnell 197–199

6. Two new Species of Marmots from Northwestern America, by Harry S. Swarth 201–204

7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. With 2 figures in text 205–307

8. Description of a new Spotted Towhee from the Great Basin, by Joseph Grinnell 309–311

9. Description of a new Hairy Woodpecker from Southeastern Alaska, by Harry S. Swarth 313–318

10. Field Notes on Amphibians, Reptiles, and Birds of Northern Humboldt County, Nevada, by Walter P. Taylor. With 6 plates 319–436

Index 437–446

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 1, pp. 1–8 May 26, 1910

TWO NEW OWLS FROM ARIZONA

WITH DESCRIPTION OF THE JUVENAL PLUMAGE OF *STRIX OCCIDENTALIS OCCIDENTALIS* (XANTUS)

BY

HARRY S. SWARTH

BERKELEY
THE UNIVERSITY PRESS

JUN

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG
Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy.

R. FRIEDLAENDER & SOHN
BERLIN
Agent for the series in American Archaeology and Ethnology, Botany, Geology, Pathology, Physiology, Zoology.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25
Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)
Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25
1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.
Nos. 1 and 2 in one cover ..... .60
3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.
Nos. 6 and 7 in one cover ..... .25
8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25
Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 1, pp. 1-8 May 26, 1910

TWO NEW OWLS FROM ARIZONA

WITH DESCRIPTION OF THE JUVENAL PLUMAGE OF *STRIX OCCIDENTALIS OCCIDENTALIS* (XANTUS)

BY

HARRY S. SWARTH.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

I first collected typical specimens of these two subspecies some years ago, but at the time refrained from designating them by name, although I appreciated the differences between these forms and their nearest allies. My hesitation was due mainly to a lack of sufficient material for comparison, and a consequent uncertainty as to the seasonal changes in plumage. Of the Arizona spotted owl I have been able to obtain but the one specimen, and the fragments of a dead bird found near a cañon stream. The examination at different times of a number of California specimens of the spotted owl (at least six besides the ones listed herewith), has failed to reveal a type of plumage approaching this new subspecies. The differences distinguishing the screech owls, though difficult to describe, are clearly apparent upon comparison of specimens, and individuals from the two designated regions appear to be constantly different.

Otus asio gilmani, new subspecies.

SAHUARA SCREECH OWL.

TYPE.—Female adult; no. 10651, Univ. Calif. Mus. Vert. Zool.; Blackwater, Pinal County, Arizona; March 29, 1908; collected by M. French Gilman; orig. no. 153.

Characters.—Most like *Otus asio cineraceus* (Ridgway), from which it differs chiefly in slightly smaller size, paler coloration and greater restriction of dark markings. Above pale ashy, darkest on crown, each feather faintly vermiculated with dusky, and with a narrow dark median stripe. Underparts somewhat darker, but still with dark markings much restricted. Legs and toes white, sparsely marked with dusky.

Remarks.—The plumage of owls is notoriously difficult to describe in set terms, and the present form is no exception to the general rule. However, although the differences distinguishing *gilmani* from *cineraceus* are not easy to translate into words, they are none the less clearly apparent upon the comparison of specimens. I recognized these distinctions some years ago (Swarth, 1904, p. 8), but hesitated to name the new race, mainly through lack of material. Since that time, whenever I have had an opportunity of handling screech owls from Arizona, I have tested the supposed characters, and found no difficulty in distinguishing the races. *Gilmani* has a peculiar earthy cast to the gray of the dorsum and wings which is quite different from the clear gray upper parts of *cineraceus*, and this alone is sufficient to distinguish the two forms. The latter is heavily marked and blotched with black, so much so as to give it a striking general resemblance to *O. trichopsis*, occurring in the same region in Arizona.

Although the two subspecies are found in about the same region geographically (in part at least), they occupy different life zones, *cineraceus* being a bird of the upper Sonoran and lower Transition, while *gilmani* is purely lower Sonoran in its distribution. A somewhat parallel case appears to exist in Colorado, as illustrated by *Otus a. maxwelliae* and *O. a. aikeni*, also inhabiting different life zones. *Gilmani* is a common resident of the giant cactus country, valleys and mesas which are subject to extremes of heat and aridity, while *cineraceus* is at home along the shaded cañon streams and on densely timbered hillsides, regions so entirely different faunally that I cannot now recall a single bird common to both places during the breeding season. I have seen examples of *gilmani* from the Santa Cruz valley near Tucson, from Blackwater, from Fort Mojave, and from

Yuma; of *cinereaceus* from the Huachuca and the Chiricahua mountains.

Though several names have been applied to the Arizona screech owls at different times, there is none available for this subspecies. First *mc'calli* and later *trichopsis* were used for all the screech owls of the *Otus asio* group that were found in the region, both properly belonging to quite different races. Then later the discovery of true *Otus trichopsis* (Wagler) in southern Arizona further complicated matters, while the determination of just what was the species *trichopsis* left the common screech owl of this region without a name, a want supplied in part by Mr. Ridgway (1895, p. 390). In response to a request for information regarding the type locality of *cinereaceus* (which is not indicated in the above-mentioned paper), Mr. Ridgway kindly sent me as a topotype a specimen collected at Fort Huachuca, Arizona, and typical of the form occurring in the higher mountains, as are others taken by myself in the same general region. Thus it is the bird of the lowlands that requires naming.

The specimen selected as the type of the new race is one of a pair of birds collected at Blackwater by Mr. M. French Gilman, of Sacaton, Arizona, and donated by him to this museum. I wish to express my gratitude to Mr. Ridgway for the loan of the example of *O. a. cinereaceus* referred to above; and also to Mr. V. W. Owen, of Los Angeles, California, for the privilege of examining a series of screech owls from Arizona, including breeding specimens of *cinereaceus* and *trichopsis* from the Chiricahua Mountains.

Strix occidentalis huachucae, new subspecies.

Arizona Spotted Owl.

Type.—Male adult; collection of G. Frean Morcom (on deposit in the University of California Museum of Vertebrate Zoology); Huachuca Mountains, Arizona; April 11, 1903. Collected by H. S. Swarth; original number 3691.

Characters.—Similar to *Strix occidentalis occidentalis* (Xantus), but slightly smaller, and conspicuously paler; white markings more extensive and dark areas less deep toned.

Description.—The single example I have of *huachucae* is appreciably paler than any of the four adult specimens of *occidentalis* available for comparison. The facial discs are gray rather than brown, as in the latter, and the brown of the top of the head and upper parts generally is of a lighter shade than in *occidentalis*, while the white spots on the individual feathers are larger and not so sharply defined. In the exposed portions of the tail the light markings are almost pure white, and form five sharply defined bars (one of them terminal), across the rectrices; in *occidentalis* the spots are broken and irregular, seldom reaching to the edge of the feathers. The white spots on the outer webs of the primaries also form broad, well-defined bars, and extend squarely across the vane of the feather, whereas in *occidentalis* the same spots are much narrower, are usually irregularly triangular in shape, and are of various shades of light brown, white only on the extreme exposed portion. The throat and the median line of the abdomen are pure white. In *occidentalis* the throat patch is buffy or grayish in color, and there is practically no unmarked area underneath. The tarsus and toes are pure white, sparsely and irregularly flecked with pale brown, while in *occidentalis* they are so closely barred with dark brown as to appear almost uniformly of that color. The under tail-coverts are pure white, narrowly barred with pale brown, while in the coast form the heavy brown bars are distinctly broader than the white ones, the latter being sometimes broken into two spots.

In *huachucae* the general tone of the underparts is very much lighter than in *occidentalis*, as the brown colored parts of the feathers are paler in color and more restricted in area, while the white spots are consequently enlarged. Thus an individual feather on the upper breast of *occidentalis* is dark brown with one, or maybe two, white spots on it, while a corresponding feather on *huachucae* would be described as white, crossed by two narrow brown bars, one of them terminal.

Remarks.—Although it is unfortunate that but a single example of the new form is at hand, pertinent material is so extremely difficult to obtain that it does not seem advisable to wait for additional specimens. While it may seem rash to attach a

name to the variety on the strength of the one specimen, the differences that distinguish this bird from true *occidentalis* are exactly such as would be expected to occur, reasoning from analogous cases; for instance, they are strictly comparable to those distinguishing *Bubo virginianus pallescens* from *B. v. pacificus* of the same general regions. This, too, may serve to bring to light specimens bearing upon the case, if there are any extant in collections, and thus subject the races to more careful scrutiny.

Strix occidentalis huachucae differs from true *occidentalis* about as the latter does from *Strix o. caurinus*. In other words, the spotted owls from southern California are about intermediate in color between the very pale Arizona race (*huachucae*) and the very dark, northwest coast form (*caurinus*), though somewhat nearer the latter. The ranges of *occidentalis* and *caurinus*, however, undoubtedly blend somewhere about central California, while it is problematical whether either of these forms extends to any point where it might intergrade with the new race.

Strix occidentalis huachucae is possibly quite generally distributed through the higher mountain ranges of Arizona, though the published records of its occurrence are but very few and rather unsatisfactory. Dr. Woodhouse (1853, p. 63) mentioned seeing barred owls in the Indian Territory, Texas, and "New Mexico," which of course leaves us uncertain as to what species of owl he saw in his journey and whether he saw it in the range of the species under discussion. Dr. Coues mentions a bird that he saw at Fort Whipple as being possibly of this species (1865, p. 162); but he does not formally include it in the list of birds of the region which he subsequently published.

The second known specimen of *Syrnium occidentale* was recorded by Ridgway (1874, p. 239), an adult female taken by Captain Bendire near Tucson, November 7, 1872. Later on, Bendire published a note referring to a nest and egg found at Whipple Station, nine miles west of Tucson, on April 17, 1872 (1882, p. 99); and in his "Life Histories of North American Birds" (1892, p. 343) speaks of a specimen taken near Whipple Station in the spring of 1872. Whether or not these various accounts all pertain to the same specimen I do not know, but it seems probable.

S. N. Rhoads reported seeing several in June on a rocky hill opposite Tucson (1892, p. 115). This is rather surprising (especially to one who has seen this same rocky hill), when the general habits and the country usually frequented by birds of this genus are taken into consideration. Another record that must be received with caution is that of Jones (1900, p. 14), who includes the species in a list of birds seen at Mellen, Arizona (on the Colorado River), July 5. Neither of these two records rests upon the basis of specimens actually secured, and in each case the locality is far out of the known zonal range of the species.

I recorded the spotted owl from the Huachuca Mountains on the basis of one specimen secured and others seen or heard (Pac. Coast Avifauna, no. 4, 1904, p. 8). The one obtained (the basis of the present description) was taken on Sutherland's ranch, near the mouth of Cave Cañon, on the west side of the mountains at an altitude of approximately 5500 feet. Others were observed at various points in the range up to about 9000 feet, usually in dense clumps of maples in the creek beds, or in the thickets of quaking aspen.

Mr. John Lewis Childs has a set of eggs included in the published list of his collection (1906, p. 81), entered as follows: "2 (eggs) Ariz. May." In a letter Mr. Childs informed me that this set was taken in the Huachuca Mountains in May, 1891, by O. Poling.

I was informed by a reliable observer that he had seen the species in the Chiricahua Mountains, so we have at least three authentic points of occurrence in southeastern Arizona, these three places being about equidistant, and approximately one hundred miles apart. Proper environmental conditions for the occurrence of this owl prevail throughout the higher mountains of central Arizona and western New Mexico, as well as in northern Mexico, but there is a vast stretch of country across southwestern Arizona and southern California which is altogether unsuited to its requirements. If the ranges of *occidentalis* and *huachucae* prove to be continuous the point of junction will probably be somewhere in Nevada.

Authentic instances of the breeding of *Strix occidentalis* in California are sufficiently rare to justify the mention in this

connection of two young birds in the collection of Mr. G. Frean Morcom (now on deposit in this museum), which were secured by him in Millard Cañon, near Pasadena, California, on June 6, 1902. The two birds apparently formed the entire brood, and were accompanied by both parents, who made their escape by flight. The young were able to fly but a very short distance, so, of course, must have been hatched in the immediate vicinity. They are in the juvenal plumage throughout, but for the rectrices and remiges, which have grown out to about two-thirds of their total length. The head and entire body is covered with thick, soft down, much lighter in color than the plumage of the adult. The ground color of the old owl is about Prout's brown (of Ridgway's Nomenclature of Colors), while the body plumage of the young is wood brown, and the head is still paler, almost ecru drab. The head is unmarked, while the entire body—back, breast, and abdomen—is traversed by narrow but distinct bars of slightly darker brown. The dorsal plumage is tipped with very light-colored—almost white—filaments, which give the entire upper parts a hoary appearance. The flank feathers are very long, almost covering the toes, are the same color as the rest of the underparts, and are faintly barred with narrow markings of a slightly darker shade. The under tail-coverts are uniform with the flanks and are also faintly barred. Legs and toes are covered with light-colored down, almost white, and are unmarked. The white spots on the outer webs of the primaries and secondaries are clear and distinct on the exposed portion of the feather, but the covered portion of the same spot is abruptly dark brown, but little paler than the rest of the feather. The rectrices are practically as in the adult, dark brown traversed by narrow bands of a paler shade of brown. In these bands also the extreme ends (the only parts exposed in the closed tail) are almost pure white, so that the general effect is of white bars across the tail.

The specimens I have had available for comparison in the present paper are as follows:

Strix occidentalis occidentalis.

No.	Sex	Collection of	Locality	Date	Length (before skinning)	Wing	Tail
151	♀	J. Grinnell	Pasadena	Nov. 30, 1894	458	323	213
152	♂	J. Grinnell	Pasadena	Nov. 30, 1894	445	321	197
.....	♂	G. F. Morcom	San Diego Co.	Oct. 11, 1885	.....	318	207
.....	juv.	G. F. Morcom	Pasadena	June 6, 1902	.....	.....	.....
.....	juv.	G. F. Morcom	Pasadena	June 6, 1902	.....	.....	.....
1674	♂	H. S. Swarth	Pasadena	Oct. 22, 1900	467	328	206
1675	♂	H. S. Swarth	Pasadena	Oct. 22, 1900	465	326	212

Strix occidentalis caurinus.

5941	♀	Univ. Calif. Mus. Vert. Zool.	Mt. Tamalpais, Cal.	May 23, 1896	.....	323	211

Strix occidentalis huachucae.

.....	♂	G. F. Morcom	Huachuca Mts., Ariz.	April 11, 1903	432	318	192

LITERATURE CITED.

Bendire, C. E.

1882. The Spotted Owl. Ornithologist and Oologist, v. 7, p. 99.

1892. Life Histories of North American Birds. Special Bull. No. 1, U. S. Nat. Mus., pp. i-viii, 1-446.

Childs, J. L.

1906. Ornithological Collection of John Lewis Childs, Floral Park, N. Y. Warbler, v. 2, pp. 66-106.

Coues, E.

1865. Ornithology of a Prairie Journey, and notes on the Birds of Arizona. Ibis, v. 2, pp. 157-165.

Jones, L., and Dawson, W. L.

1900. A Summer Reconnoissance in the West. Wilson Bull., No. 33, pp. 1-39.

Rhoads, S. N.

1892. The Birds of Southeastern Texas and Southern Arizona observed during May, June, and July, 1891. Proc. Acad. Nat. Sci., Philadelphia, 1892, pp. 98-126.

Ridgway, R.

1874. Two Rare Owls from Arizona. Am. Nat., v. 8, pp. 239-240.

1895. On the Correct Subspecific Names of the Texas and Mexican Screech Owls. Auk, v. 12, pp. 389-390.

Swarth, H. S.

1904. Birds of the Huachuca Mountains, Arizona. Pac. Coast Avifauna, No. 4, pp. 1-70.

Woodhouse, S. W.

1853. Report of an Expedition down the Zuñi and Colorado Rivers, by Captain L. Sitgreaves. Birds. By S. W. Woodhouse, M.D., pp. 58-105. War Dept., Washington.

Vol. 3.
1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
   Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
   Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
    Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
    Index, pp. 369-383.

Vol. 4.
1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
   Nos. 6 and 7 in one cover. April, 1908 ..... .50
   Index, pp. 395-400.

Vol. 5.
1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
   Nos. 6 and 7 in one cover. February, 1910 ..... .20

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.
9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.
10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15
11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.
12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10
2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20
3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30
4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50
5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10
6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50
7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35
8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10
9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 187-201. May, 1910 ..... .15

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

AMERICAN ARCHAEOLOGY AND ETHNOLOGY.—F. W. Putnam, Editor. Price per volume $3.50 (Volume 1, $4.25). Volumes 1-4 and 6 completed. Volumes 5, 7 and 8 in progress.

BOTANY.—W. A. Setchell, Editor. Price per volume $3.50. Volumes I (pp. 418), II (pp. 354), and III (pp. 400), completed. Volume IV (in progress).

GEOLOGY.—Bulletin of the Department of Geology. Andrew C. Lawson, Editor. Price per volume $3.50. Volumes I (pp. 428), II (pp. 450), III (pp. 475) and IV (pp. 462), completed. Volume V (in progress).

PATHOLOGY.—Alonzo Englebert Taylor, Editor. Price per volume, $2.50. Volume I (pp. 347) completed.

PHILOSOPHY.—George Holmes Howison, Editor. Price per volume $2. Volume I (pp. 262) completed. Volume II (in progress).

PHYSIOLOGY.—Jacques Loeb, Editor. Price per volume $2.00. Volume I (pp. 217) completed. Volume II (pp. 215) completed. Volume III (in progress).

MEMOIRS OF THE UNIVERSITY OF CALIFORNIA (Quarto).

Vol. 1. No. 1. Triassic Ichthyosauria, with special reference to the American Forms. By John C. Merriam. Pages 1-196, plates 1-18, 154 text figures. September, 1908 ..... $3.00

Other series in Classical Philology, Economics, Education, Egyptian Archaeology, Engineering, Entomology, Graeco-Roman Archaeology, Mathematics, Psychology, Semitic Philology, Modern Philology.

UNIVERSITY OF CALIFORNIA CHRONICLE.—An official record of University life, issued quarterly, edited by a committee of the faculty. Price, $1.00 per year. Current volume No. XII.

Address all orders, or requests for information concerning the above publications to The University Press, Berkeley, California.

European agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, and Semitic Philology, Otto Harrassowitz, Leipzig. For the Memoirs, and the series in Botany, Geology, Pathology, Physiology, Zoology and also American Archaeology and Ethnology, R. Friedlander & Sohn, Berlin.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 2, pp. 9-172, plates 1-6, 3 text-figures January 12, 1911

BIRDS AND MAMMALS OF THE 1909 ALEXANDER ALASKA EXPEDITION

BY
HARRY S. SWARTH

BERKELEY
THE UNIVERSITY PRESS

Smithsonian Institution
JAN 24

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN
BERLIN

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.

1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2.

(Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

Nos. 1 and 2 in one cover ..... .60

3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

Nos. 6 and 7 in one cover ..... .25

8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 2, pp. 9-172, plates 1-6, 3 text-figures January 12, 1911

BIRDS AND MAMMALS OF THE 1909 ALEXANDER ALASKA EXPEDITION

BY

HARRY S. SWARTH.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

CONTENTS.

PAGE

Introduction 9
Descriptions of Localities 12
Check-list of the Birds 26
General Accounts of the Birds: Distribution, Molt, Variation, Biographical Notes 28
Check-list of the Mammals 113
General Accounts of the Mammals: Distribution, Variation, Biographical Notes 113
New Mammals Described:
Evotomys phaeus 127
Microtus coronarius 131
Ursus americanus pugnax 141
Distributional Considerations 151
Literature Cited 160

INTRODUCTION.

In 1909 Miss Annie M. Alexander organized and financed an expedition for the exploration of such parts of the Sitkan district, Alaska, as had not been touched by the expedition of 1907[1]—at least to such an extent as could be done in a single

[1] Field work in Alaska has been prosecuted as follows: In 1906 on the Kenai Peninsula; in 1907 in the Sitkan district; in 1908 in the Prince William Sound region; and in 1909 in the Sitkan district.

season. The party consisted of Allen E. Hasselborg of Juneau, Alaska, and the writer. Our means of transportation was a gasolene launch, twenty-eight feet long and seven foot beam. Camp was established ashore at most of the points visited. Hasselborg spent most of his time in hunting the larger mammals, though he occasionally ran lines of small traps, or shot a few birds, leaving the writer free to devote himself entirely to the small mammals and birds.

The region explored by this expedition, together with that of 1907, includes practically the whole of the Sitkan district as restricted by later writers: the mainland coast of Alaska and the islands (the Alexander Archipelago) lying between Juneau and Cross Sound on the north, and Dixon Entrance on the south. This area is about two hundred and fifty miles long, from Cross Sound to Dixon Entrance, with an average width of about one hundred miles. The previous expedition had collected at various points on the more northern islands of the group, Admiralty, Chichagof, and Baranof, as well as at Glacier Bay on the mainland; so it was planned to begin operations south of Frederick Sound, work south along the western edge of the archipelago as far as Dixon Entrance, and, on the return trip north, to visit the inner islands, and such mainland points as time permitted and it seemed desirable to explore.

I left San Francisco on March 31, arriving in Juneau on April 8. We left Juneau on the morning of April 9, and on October 1, I sailed for home from the same point. During October and November Hasselborg visited the Taku River and points on Admiralty and Chichagof islands, collecting material which has been included in the present report. The following is the itinerary of the expedition:

Itinerary.

Juneau, April 8.
Kake, Kupreanof Island, April 9.
Keku Straits, Kupreanof Island (two camps), April 10-18; 18-25.
Three-mile Arm, Kuiu Island, April 25 to May 6.
Port Protection, Prince of Wales Island, May 6 to 10.
Shakan and Calder Bay, Prince of Wales Island, May 10 to 14.
Egg Harbor, Coronation Island, May 14 to 18.
Port McArthur, Kuiu Island, May 18, 19.

Warren Island, May 19 to 23.
Heceta Island, May 23, 24.
San Alberto Bay, Prince of Wales Island, May 24 to 26.
Klawak Salt Lake, Prince of Wales Island, May 26 to 29.
Suemez Island, May 29, 30.
Rocky Bay, Dall Island, May 30 to June 4.
West Coast of Dall Island, June 4 to 6.
McLeans Arm, Prince of Wales Island, June 6, 7.
Duke Island, June 7 to 9.
Marten Arm, Boca de Quadra (mainland), June 9 to 14.
Annette Island, June 14, 15.
Gravina Island, June 15, 16.
Chickamin River (mainland), June 17 to 28.
Portage Cove, Revillagigedo Island, June 28 to July 4.
Hassler's Pass, Revillagigedo Island, July 4, 5.
Etolin Island, July 5 to 12.
Fool's Inlet, Wrangell Island, July 12 to 18.
Bradfield Canal (mainland), July 18 to 26.
Port St. John, Zarembo Island, July 27 to August 1.
Mitkof Island, August 1 to 13.
Thomas Bay (mainland), August 13 to 23.
Port Snettisham (mainland), August 24 to September 2.
Juneau, September 2, 3.
Taku River (mainland), September 4 to 28.
Juneau, September 28.

Thus we visited sixteen islands and six mainland localities; on some of the islands we established several camps.

The accompanying map (plate 1) of the region, copied from a chart issued by the United States Coast and Geodetic Survey, shows the route of the expedition and points where collecting was carried on. Names of localities used in the report are all to be found on this map.

The ornithological material collected consists of 604 bird skins; the mammals of 472 skins with skulls, 24 skulls without skins, 47 small mammals in alcohol, and 13 shed deer antlers.

These specimens have all been donated by Miss Alexander to the University of California Museum of Vertebrate Zoology, and they, together with the field notes made during the season both by Hasselborg and myself, form the basis of the present report. Twenty-seven species of mammals are listed, twenty-six represented by specimens collected. One hundred and thirty-seven species of birds are included in the report, specimens being taken of one hundred and six.

In color descriptions Ridgway's "Nomenclature of Colors," 1886 edition, has been followed as closely as was practicable. Measurements are in millimeters unless otherwise specified. The species of plants mentioned in the report were identified by

Professor H. M. Hall, of the University of California, from specimens collected and now in the University Herbarium.

I should like here to express my appreciation of courtesies received from several institutions and individuals in connection with this report: To the authorities of the United States National Museum for the loan of bird skins, as indicated under the various species in the general report following; to Dr. C. Hart Merriam, Chief of the Biological Survey, for the loan of specimens of birds and mammals; to Mr. E. A. Preble and Mr. N. Hollister for specific information on certain puzzling forms; to Professor J. O. Snyder, of Leland Stanford Junior University, for the loan of a series of skins of *Sciurus h. vancouverensis* from the collection of that institution; and to Professor Chas. A. Kofoid, of the University of California, for critical reading of the final manuscript.

DESCRIPTIONS OF LOCALITIES.

KUPREANOF ISLAND.

We made two camps on this island, the first being some five or six miles above the south end of Keku Straits. These straits, separating Kupreanof and Kuiu islands, are exceedingly narrow at this point, being, in places, less than a hundred feet across; they are navigable, even to as small a boat as ours, only at high tide, as there are series of rapids in them at low water. Thus they are practically no barrier at all to the distribution of animal life, and the same species of birds and mammals range over both islands. As the channels between Kupreanof and Mitkof, and Mitkof and the mainland, are likewise narrow and shallow, some of the mainland fauna is thus carried almost to the western extremity of the archipelago.

We remained but a few days in our first camp and then moved to a point some three miles farther south, where the presence of two fairly large streams with bordering meadow land gave promise of better results than we had been obtaining. This part of Kupreanof Island is quite flat with no conspicuous mountain ranges anywhere. There were two peaks some six or seven miles north of our camp, which are about 1500

feet high—round-topped hills, covered with timber; while the same distance south of us was a ridge that reached an altitude of approximately 2,000 feet. Some steep cliffs were visible along the sides, and the top was bare of timber and snow-covered.

The larger of the two streams was explored inland for fifteen miles. The drainage appears to be mostly toward the west side of the island.

Near the beach, and along the streams, is a dense growth of timber, mostly spruce and hemlock, with some cedar; farther back the country opens up into a series of parks, covered with a scattering growth of scrubby pines from ten to thirty feet high, boggy and hummocky underfoot, and with a thick carpet of moss. Along the beach the forest is bordered with a scattering fringe of alder.

During our stay on Kupreanof, April 10 to 25, the weather was quite cold. The thermometer dropped as low as 6° C., and we had several snowstorms. Land birds were extremely scarce and of few species, nor was there any species of small mammal that was at all abundant.

THREE-MILE ARM, KUIU ISLAND.

Our camp at this point was in a little cove on the east side of the inlet, and some three miles from its head. On this part of Kuiu Island the coast line is very much cut up with bays and inlets, and the country is more hilly and uneven than on Kupreanof. In vegetation the two places are essentially the same. The conspicuous feature of this place is the extensive tide flats. The whole head of the inlet is bare at low tide, exposing hundreds of acres of mud banks, and these fairly swarmed with wading birds of various species. As land birds were still very few in numbers most of my time was devoted to the securing and preparation of series of these waders, and a good representation was obtained. We remained here from April 25 to May 6.

Kupreanof and Kuiu together are generally known as the Kake Islands, from the tribe of Kake Indians, which inhabits them.

PORT PROTECTION, PRINCE OF WALES ISLAND.

A long and rather narrow inlet at the northwestern extremity of the island. The bay is some three miles long and winds so that the head of the inlet is sheltered from storms from any direction. The country surrounding is extremely rough and rugged, and the timber a mass of windfalls, so that traveling was difficult. The beach is narrow and precipitous, so much so that we were unable to establish a camp ashore, and were obliged to live on the launch during our stay at this point. Several small streams empty into the bay, none of them large enough to permit of the salmon ascending much above tide-water. Along these creeks there is a little meadow land. The forest presents the usual combination of fir and hemlock, with a little cedar, and alder along the beach. The broken hills surrounding the bay culminate at the south in the high peak of Mt. Calder. We remained at this point from May 6 to 10, and though the alders were beginning to bud, and a little green grass to appear in favored spots, the snow still lay deep in the woods. Land birds were extremely scarce.

SHAKAN AND CALDER BAY.

Shakan is a small settlement on Kosciusko Island, at the northwestern extremity of Prince of Wales Island. Calder Bay is a long inlet extending some six or eight miles north of Shakan. In a straight line these places are not more than twenty-five miles from Port Protection, and the character of the country is essentially the same. We ran traps and collected birds at three different points in this vicinity, at the Calder Marble quarry, but a short distance from Shakan, at the head of Calder Bay, and at the entrance of Klawak Passage, the exceedingly narrow channel between Kosciusko and Prince of Wales islands. The weather was stormy during the whole of our stay at this point, May 10 to 14; in fact we were waiting here, in comparative shelter, for the weather to settle and permit us to reach Coronation Island, our next objective point.

CORONATION ISLAND.

A small island lying south and west of the southern extremity of Kuiu, and about forty miles southwest of Shakan. We

anchored near the head of Egg Harbor, on the north side of the island, a narrow and perfectly straight inlet, about a mile long and a quarter of a mile wide. With the southerly winds prevailing during our stay this bay is quite calm and unruffled, but it is exposed toward the north, where it looks straight up Chatham Straits, and the ocean swell enters unhindered. At the head of the bay, and in places on the west side, are sandy and gravelly beaches, and quite at the head of the bay a good-sized stream empties. On the west side of the harbor is Pin Peak, about 1300 feet high, and south, towards the center of the island, Needle Peak, 1700 feet. The upper half of Pin Peak is devoid of timber, and barren but for a covering of grass. The timber on the island was a mixture of spruce, hemlock, and cedar, with alders and crabapples along the beach. At the head of the bay the forest is quite open and easy to traverse, being almost devoid of underbrush, while the ground is carpeted deeply with moss. At the foot of Pin Peak is an abandoned mine, with numerous sheds and other buildings still standing, serving as shelters for the deer, as we had opportunities of observing. There are also some caves here that had evidently been used as dwellings by the mine operators. The island is about ten miles long, and between five and six miles across at the widest point. The name "Egg Harbor" is a misnomer, as we found no colonies of sea birds anywhere in the vicinity. On the Hazy Islands, some jutting rocks ten or twelve miles to the westward, we were told that there were many such.

The mammals noted on Coronation Island were *Odocoileus, Lutreola, Microtus* (a species peculiar to this and Warren Island), *Peromyscus,* and *Sorex.* There was no sign of bear or wolves. The weather was pleasant during our stay here, May 14 to 18, and birds were abundant.

PORT McARTHUR, KUIU ISLAND.

A bay near the southern extremity of Kuiu, and about fifteen miles north of Coronation Island. We ran in here for shelter on May 18, leaving again next morning. A line of traps brought small results.

WARREN ISLAND.

A small island lying directly between Kosciusko and Coronation islands, but much nearer the former. The affinities of the mammalian fauna proved to be distinctly with Coronation Island, but this was not true of the avifauna. The sooty grouse, so conspicuous on the latter island, is not found here, while we have strong reasons to believe that the Franklin grouse, of Prince of Wales and adjoining islands, does occur. Our camp was on the east side of the island, where a slight bend in the shore line afforded a fair degree of shelter. The forest was of the usual type throughout the region. A rather conspicuous feature of the place was the abundance of large-sized abalone shells scattered along the shore, and even far back in the woods, carried possibly by the ravens. We saw these shells nowhere else during the summer. We remained at Warren Island from May 19 to 23.

HECETA ISLAND.

Lying at the western edge of Prince of Wales Island, where it forms the southern boundary of Sea Otter Sound. On May 23 we coasted along the northern shore of the island, exploring Port Alice and two other unnamed bays, but finding no promising collecting ground. Traps set at the eastern end of the island brought few results.

SAN ALBERTO BAY, PRINCE OF WALES ISLAND.

An indentation on the west coast, and about at the center of the island. We anchored on the north shore of the bay, near where two good-sized streams emptied into it. Aside from a few small tracts of grassy land near the beach there was no open country, nothing but thick forest, and birds were very scarce. Hasselborg found sign of two bear, both of which he secured. We were here from May 24 to 26.

KLAWAK SALT LAKE.

A long, inland extension of San Alberto Bay, but so blocked by islands at its entrance as to be more like a lake than an arm of the sea. The tide, which rises to such unusual heights elsewhere

in the region, was in this sheltered spot almost imperceptible. Along the shores of the lake are stretches of grassy meadow land, while the forest was in places open enough to be traversed readily. The weather was pleasant during our stay here, May 26 to 29, but neither birds nor mammals were at all abundant.

SUEMEZ ISLAND.

From Klawak we headed due south, planning to go direct to Forrester Island if the weather permitted, but it turned so stormy that we were obliged to anchor in a sheltered spot at the eastern extremity of Suemez Island. A short exploration showed it to be discouragingly barren, hardly a bird to be seen anywhere, and no indication of mammals, large or small. A line of traps set out the night of May 29 brought in scanty results.

"ROCKY BAY," DALL ISLAND.

A deep and perfectly sheltered indentation at the northwestern extremity of Dall Island. This bay is unnamed and uncharted, but is shown on ou map (plate 1). The stormy weather forced us in here, where we anchored in perfect safety, but at low tide found ourselves surrounded by jagged rocks. Several good-sized streams empty into the head of the bay, and the woods are in places fairly easy to traverse, either by following these streams or by crossing the scattered series of more open parks. Many sea lions were observed in this bay, the only place where they were met with in any numbers during the summer. Exeeedingly stormy weather prevailed during the whole of our stay here, so birds were naturally hard to find. Small mammals were also extremely scarce.

On these islands a fair test of the comparative abundance of the smaller mammals is the amount of meadow-mouse sign. Many well-traveled *Microtus* runways usually mean plenty of certain other species as well, while in the absence of these highways it is but seldom that the traps are productive.

We remained at Rocky Bay from May 30 to June 4, awaiting a favorable opportunity to cross over to Forrester Island, a small isolated island some fifteen miles to the westward. The Indians use it as a station for hunting the sea otter, and it is

also said to harbor numerous breeding sea birds. On June 4, 5 and 6, we made abortive efforts to reach the island, but were as often prevented by the continual stormy weather, and driven for shelter into various uncharted bays on the west coast of Dall Island. On June 6 we made our last attempt, but an impending southeaster drove us once more around the north end of Dall Island.

PORT McLEAN, PRINCE OF WALES ISLAND.

We dropped anchor at the head of this long, narrow fiord, near the southern extremity of Prince of Wales Island, at about 11 p. m. on June 6. A hasty inspection of the place early the next morning revealed dense, impenetrable forest, with rocky, forbidding shores, with no indication of bird or animal life.

DUKE ISLAND.

At the southern extremity of the Alexander Archipelago. We anchored on the north side of the island, which is quite flat. There is a thin fringe of timber near the beach; inland there appeared to be but a scattering growth of scrubby pines. Several very small streams emptied in the vicinity of our anchorage. Most of the drainage seemed to be toward the other side of the island. There was no meadow land anywhere in the vicinity. We remained here from June 7 to 9.

MARTEN ARM, BOCA DE QUADRA.

Boca de Quadra is a long and very narrow inlet or fiord piercing the mainland coast at what is almost the southermost extremity of Alaska. Its walls are steep and precipitous in the extreme, so much so that for miles there is not a foot of beach where a landing could be effected, the dense forest growing down to within a few feet of the high-tide mark, where the rocky walls drop perpendicularly into the water. We ascended to the head of Marten Arm, a southern branch of the inlet, where we established a camp, some twenty-five miles from the coast. Here, at its head, are hundreds of acres of grassy flats, cut up by innumerable gullies and ditches, full of water at high tide. A large river flows down the center of the valley,

while on either side smaller streams issue from every cañon and ravine. The surrounding mountain sides are steep and heavily timbered for the most part, though with many barren cliffs and snow covered peaks in the higher parts. On the floor of the valley there are groves of timber of varying extent, together with many clumps of underbrush and patches of willow. Besides the usual spruce, hemlock and cedar, we here encountered the balsam fir for the first time. Altogether it was a beautiful and attractive spot, the broad open meadows, a mass of blooming wild flowers at this time, being particularly pleasing after the gloomy forests in which we had been working so long. Animal life was abundant and a quantity of interesting material was gathered; but unfortunately a band of Indians was in here hunting bear, and it was useless to look for big game under the circumstances. We paid a visit to the Indian camp to inspect their catch, and found that besides bear they had some beaver, otter, and wolverine, all caught within a radius of about thirty miles. Our stay at Marten Arm was from June 9 to 14. All the references in the text to Boca de Quadra refer to this camp at the head of Marten Arm.

ANNETTE ISLAND.

On our way from Boca de Quadra to Ketchikan we stopped one night, June 14, at Hassler Harbor, on the northeast coast of Annette Island. It presents the usual appearance of these southern islands, with dense timber down to the water's edge, and with little or no open meadow land. A string of eighty traps produced just one *Peromyscus,* and no birds of interest were observed.

GRAVINA ISLAND.

June 15 and 16 were spent in the town of Ketchikan, on Revillagigedo Island. On the evening of the 15th we crossed the narrow channel to the neighboring island of Gravina, where I went ashore long enough to put out some traps. I did not go back far from the beach, but the timber appeared to be thin and sparse compared with most of the places we had visited, and while there were several trickling rivulets nearby there was no stream of any size. Neither was there any meadow land

whatever in the immediate vicinity. The beach was thickly strewn with drift, affording refuge to numerous mice of the genus *Peromyscus.*

CHICKAMIN RIVER.

A broad, shallow river on the mainland coast of southern Alaska, emptying into Behm Canal a little north of the center of Revillagigedo Island. Our camp was located about two miles from the mouth of the river, on the north bank, and unless otherwise specified, all the specimens mentioned as collected on the Chickamin River were taken within five miles of this camp. On all sides were broad stretches of meadow land, waist high with grass and flowers, and dotted with clumps of spruce or willow, while on the edges were scattering fringes of alder, between the meadows and the forest. The valley at this point is some three or four miles across, and on either side the mountains rise steep and precipitous.

PORTAGE COVE, REVILLAGIGEDO ISLAND.

Directly opposite the mouth of the Chickamin River. Although the chart showed only a little bay or inlet at this point, we discovered that a good-sized stream pierced the rocky wall on the south side of the cove, like a narrow gateway, opening into a broad, level valley beyond. We ascended the river about three miles and established camp on the north side of the stream. On both sides of the river are broad grass-covered meadows, intersected in all directions by winding tide sloughs. Although the river banks are ten feet high or more, these meadows are all swampy, with pools scattered everywhere. In places long tongues of woodland extend out into these open tracts, scattered growths of spruce, hemlock and cedar, with much low underbrush; but even in this timber the ground is saturated, and the trees do not thrive as there are as many dead stubs as live trees. (See plate 2.) In places there are clumps of scrubby willow, and here and there large areas entirely covered with them. The valley is about half a mile across at the site of our camp, with the mountains rising abruptly at either side. At their base the underbrush is so thick as to be impassable. Apparently the winter climate of this place is

severe. At the time of our stay, June 28 to July 4, the snow lay deep in sheltered spots in the cañon, and also on the north slope of the hills, while the absence of any deer sign was in itself an indication of a climate much harsher than that of the more western islands.

HASSLER'S PASS, REVILLAGIGEDO ISLAND.

A narrow channel at the northeastern extremity of Revillagigedo Island. We passed the night of July 4 in a little cove at this point, where some traps were set out. The entire northern coast line of the island as observed by us is rocky and precipitous in the extreme, with no large streams nor any level land in sight.

ETOLIN ISLAND.

We camped in a bay at the southern end of the island, where an abandoned fishing camp afforded shelter. The country in the immediate vicinity is flat, with the hills some distance back; along the beach is a strip of heavy timber some two or three hundred yards wide, consisting of spruce, hemlock, and a good deal of cedar, and with much thick underbrush. Back of this are long stretches of parks. There is no meadow land anywhere in the vicinity. We were on Etolin Island from July 5 to 12.

FOOL'S INLET, WRANGELL ISLAND.

A long, narrow and extremely rocky and precipitous bay at the southern end of the island, where we remained from July 12 to 18. Hasselborg saw several bear at this place, but inclement weather made our stay here unprofitable. We traversed the entire eastern side of the island without seeing a single bay or inlet that gave promise of being good collecting ground. The shores are everywhere abrupt and rocky.

BRADFIELD CANAL.

A long, narrow fiord extending into the mainland directly east of Wrangell Island. We ascended nearly to its head, where we pitched camp on a little wooded peninsula, on the north side of the bay, at the mouth of a good-sized river. The shores of the canal are rocky and precipitous, and there is no beach anywhere, except some mud flats at the mouth of the river,

exposed at low tide. The timber comes down to the water's edge, where it is fringed by a strip of beach grass, and is everywhere dense and impenetrable except on the extremity of the point on which our camp was located. Here the woods are fairly open. We stayed here from July 18 to 26.

PORT ST. JOHN, ZAREMBO ISLAND.

After staying one night at the town of Wrangell (July 26) we went on to Port St. John, at the north end of Zarembo Island. This bay is about a mile long and something less than half that in width; but at low tide more than two-thirds of it is mud flats. Two small streams empty into the head of the inlet, and on the west side there is a spring of mineral water. The surrounding slopes are densely wooded, mostly with spruce and hemlock, for there is but little cedar just at this point, and there is the usual tangle of more or less dense underbrush. There is no meadow land anywhere in the vicinity. Deer are abundant on the island, but as it is a favorite hunting ground of the people at Wrangell, we found the bucks pretty well thinned out. There was some wolf sign, but no indication of bears. We were on Zarembo Island from July 27 to August 1.

MITKOF ISLAND.

On August 1 we left Port St. John, and sailed north through Wrangell Narrows, around the north end of Mitkof Island, and south along the east side, to a point about midway of the island. Here we established a camp on the beach, at a place lying between two small rivers. There is no meadow land in the vicinity, and the trapping, as well as most of the bird collecting, was done along the beach. There were quantities of drift strewn along the shore, and a broad strip of beach grass, both together affording food and shelter to quantities of white-footed and meadow mice. The southward migration of the birds had begun at this time, and they were fairly abundant along the edge of the woods. Farther back in the timber, even along the streams, both birds and mammals were scarce. The salmon were running at the time of our visit, and as no Indians had been hunting or trapping in the vicinity, bear were fairly abundant.

Hasselborg saw seven. Although this island is very closely connected with the mainland we failed to find any indication of the presence of such mainland forms as *Erethizon, Evotomys,* or *Zapus,* which might be expected to occur here. We remained here from August 1 to 13.

THOMAS BAY.

An indentation on the mainland about opposite the north end of Kupreanof Island. Our camp was in a little cove on the west side of the south arm of the bay. This corner of the bay is densely wooded down to the water's edge, but in the main river valley, around a point a few hundred yards distant, were broad expanses of mud flats and meadows; also stretches of gravelly bottom land, sparsely covered with grass, and at times evidently flooded by the stream. All these flat lands are intersected by numerous little rivulets and sloughs, ideal feeding grounds for numbers of ducks and geese. Below the meadow land are vast expanses of mud flats, covered at the time of our stay by flocks of thousands of small waders. The upper margins of the meadows are bordered by clumps of alder. Toward the base of the hills on either side the coniferous forest begins, and a mile or so up the river there are a few cottonwoods.

During the time of our stay at this point, August 13 to 23, the southward migration of the water birds had fairly set in, and every day throngs of ducks and waders were seen arriving and departing. The land birds also were moving, but not in so conspicuous a manner.

PORT SNETTISHAM.

A deep indentation on the mainland coast about thirty miles south of Juneau. We ascended the north arm of the bay some fifteen miles, pitching camp on the north side of the inlet. At this point a little peninsula projects out into the bay about half a mile. The best collecting grounds are on the mountain slopes to the eastward, but as there is no suitable camping ground there, we placed our camp on the beach west of this peninsula. The peninsula is densely wooded with conifers down to the shore line, with abrupt rocky slopes, but in the bay to the east

of it, where I did most of my collecting, the mountain slopes are bare of such woods. At the water's edge are many acres of tall grass, waist high or higher, flooded at high tide, and at this time the haunt of numerous mallards. The center of the valley is occupied by a dense willow swamp, quite impenetrable, and traversed by many rushing streams. On either side, and broadening in extent as the mountain is ascended, are wide stretches of open country, apparently smooth and level, as viewed from the distance, but in reality a mass of jumbled boulders, covered with moss and hidden by tangles of vines and ferns. Some of the slopes and ridges are densely grown up with brush (*Cladothamnus pyrolaeflorus*) and here and there is an occasional scrubby spruce tree. Higher up, the mountains rise steep and precipitous, and at the foot of the cliffs were deep snow banks. In the bay where our camp was located the forest comes down to the water's edge, but this timbered area is comparatively narrow. We were at Port Snettisham from August 24 to September 2.

TAKU RIVER.

A deep and broad stream emptying into Taku Inlet, which in turn opens into Stephens Passage at a point some ten miles south of Juneau. We ascended the river about twenty miles, pitching camp on the south side of the stream. This river forms a direct pass from the interior of the country, and is used as such by both prospectors and Indians. Birds and mammals of the interior also reach the coast by this means, and for this reason we found it an interesting point to work. We found such inland species as *Zapus saltator* and *Microtus drummondi* among the mammals, and *Geothlypis trichas occidentalis*, *Dendroica striata* and *Sialia currucoides* among the birds. Hasselborg saw fresh tracks of a moose (*Alces a. gigas*) which had come down to the bank of the river opposite the launch during the night, this being probably as near the coast as the species is known to occur. He also heard a ruffed grouse (*Bonasa u. umbelloides?*) drumming several times. There was abundant sign of willow ptarmigan (*Lagopus lagopus?*) in the thickets, feathers and droppings, but it was impossible to penetrate the

willow and alder swamps which they frequented. I saw grasshoppers here upon our first arrival, seen nowhere else during the summer, and also two species of butterflies not observed at any other point.

In the vicinity of our camp the river was from half a mile to a mile wide, with steep, abrupt banks all along its course and no shore at all suitable for waders, which were consequently almost absent. At this place there is a tract several miles long and half a mile wide, approximately, a short distance back from the river, grown up with dry woods such as I saw nowhere else in southeastern Alaska. There is a scattering growth of cottonwoods, with a few birch and a sprinkling of spruce, and very little underbrush, the ground below being dry and gravelly and almost bare of grass. Between these woods and the river there is a strip of alder, which, except in a few places, is very difficult to penetrate, while south of these woods is another and broader belt of alder and willow swamp. Beyond this, between the brush and the mountains, is a stretch of meadow land, thousands of acres in extent, which at the time of our stay was mostly flooded with water. Below my camp, bordering the river, were stretches of meadows that were comparatively dry. Across the river are thousands of acres of willow and alder swamp, impossible to penetrate. The mountains rise abruptly on either side of the valley, and are almost barren of timber of any sort.

We remained here from September 4 to 28. The first four days in September were bright and sunshiny, but beginning on the 5th it rained steadily during the remainder of our stay. Toward the end of September it turned much colder, and there were several snow flurries. At the base of the mountains there were deep snow banks that had evidently remained throughout the summer. I left Juneau for home on October 1, but on October 13 Hasselborg returned to the Taku for another hunt. Continued inclement weather made the trip a failure, although he saw several mountain goats. He also saw twelve-inch tracks of what was probably a grizzly, as well as sign of several black bear.

GAME COVE, ADMIRALTY ISLAND.

Near Marsden Point, Admiralty Island, near the north end of Chatham Strait. Hasselborg spent several days here the middle of November.

FRESHWATER BAY, CHICHAGOF ISLAND.

On the eastern shore of Chichagof Island. Hasselborg was here a month, from November 12 to December 12, and collected a series of deer, as well as some small birds and mammals. In his notes he remarks that at the time of his arrival there were two big brown bear (*Ursus sitkensis?*) still out, and on November 13 he shot at one but lost the track in the falling snow. I mention this as of interest as indicating the approximate date for going into hibernation. No tracks were seen at a later date. The weather was severe at this time, with north winds and heavy snow fall. Three feet of snow covered the ground at tide-water when he left.

CHECK-LIST OF THE BIRDS.

1. *Colymbus holboelli* (Reinh.)
2. *Colymbus auritus* Linn.
3. *Gavia immer* (Brünn.)
4. *Gavia pacifica* (Lawr.)
5. *Gavia stellata* (Pont.)
6. *Lunda cirrhata* (Pall.)
7. *Cerorhinca monocerata* (Pall.)
8. *Synthliboramphus antiquus* (Gmel.)
9. *Brachyramphus marmoratus* (Gmel.)
10. *Cepphus columba* Pall.
11. *Uria troille californica* (Bryant)
12. *Larus glaucescens* Naum.
13. *Larus argentatus* Pont.
14. *Larus brachyrhynchus* Rich.
15. *Larus philadelphia* (Ord)
16. *Sterna paradisaea* Brünn.
17. *Phalacrocorax pelagicus* Pall.
18. *Mergus americanus* Cass.
19. *Mergus serrator* Linn.
20. *Anas platyrhynchos* Linn.
21. *Nettion carolinense* (Gmel.)
22. *Dafila acuta* (Linn.)
23. *Marila marila* (Linn.)
24. *Clangula clangula americana* Bonap.
25. *Charitonetta albeola* (Linn.)
26. *Harelda hyemalis* (Linn.)
27. *Histrionicus histrionicus* (Linn.)
28. *Oidemia americana* Swains.
29. *Oidemia deglandi* Bonap.
30. *Oidemia perspicillata* (Linn.)
31. *Chen hyperborcus* (Pall.)
32. *Anser albifrons gambeli* Hartl.
33. *Branta canadensis occidentalis* (Baird)
34. *Ardea herodias fannini* Chapm.
35. *Grus canadensis* (Linn.)
36. *Lobipes lobatus* (Linn.)
37. *Gallinago delicata* (Ord)

38. *Macrorhamphus griseus scolopaceus* (Say)
39. *Arquatella maritima couesi* Ridgw.
40. *Pisobia maculata* (Vieill.)
41. *Pisobia bairdi* (Coues)
42. *Pisobia minutilla* (Vieill.)
43. *Pelidna alpina sakhalina* (Vieill.)
44. *Ereunetes pusillus* (Linn.)
45. *Ereunetes mauri* Cab.
46. *Totanus melanoleucus* (Gmel.)
47. *Totanus flavipes* (Gmel.)
48. *Helodromas solitarius cinnamomeus* (Brewst.)
49. *Heteractitis incanus* (Gmel.)
50. *Actitis macularius* (Linn.)
51. *Squatarola squatarola* (Linn.)
52. *Aegialitis semipalmata* (Bonap.)
53. *Aphriza virgata* (Gmel.)
54. *Arenaria melanocephala* (Vig.)
55. *Haematopus bachmani* Aud.
56. *Dendragapus obscurus fuliginosus* (Ridgw.)
57. *Canachites franklini* (Dougl.)
58. *Lagopus rupestris dixoni* Grin.
59. *Circus hudsonius* (Linn.)
60. *Accipiter velox* (Wils.)
61. *Astur atricapillus striatulus* Ridgw.
62. *Buteo borealis alascensis* Grin.
63. *Archibuteo lagopus sanctijohannis* (Gmel.)
64. *Haliaëëtus leucocephalus alascanus* Towns.
65. *Falco columbarius columbarius* Linn.
66. *Falco sparverius sparverius* Linn.
67. *Pandion haliaëtus carolinensis* (Gmel.)
68. *Asio wilsonianus* (Less.)
69. *Asio flammeus* (Pont.)
70. *Cryptoglaux acadica scotaea* (Osgood)
71. *Bubo virginianus saturatus* Ridgw.
72. *Ceryle alcyon caurina* Grin.
73. *Dryobates villosus harrisi* (Aud.)
74. *Dryobates pubescens glacialis* Grin.
75. *Picoides americanus americanus* (Swains.)
76. *Sphyrapicus varius ruber* (Gmel.)
77. *Colaptes cafer saturatior* Ridgw.
78. *Cypseloides niger borealis* (Kennerly)
79. *Chaetura vauxi* (Towns.)
80. *Selasphorus rufus* (Gmel.)
81. *Nuttallornis borealis* (Swains.)
82. *Myiochanes richardsoni richardsoni* (Swains.)
83. *Empidonax difficilis* Baird
84. *Empidonax trailli alnorum* Brewst.
85. *Pica pica hudsonia* (Sab.)
86. *Cyanocitta stelleri stelleri* (Gmel.)
87. *Corvus corax principalis* Ridgw.
88. *Corvus brachyrhynchos caurinus* Baird.
89. *Euphagus carolinus* (Müll.)
90. *Pinicola enucleator flammula* Homeyer
91. *Loxia americana sitkensis* Grin.
92. *Loxia leucoptera* Gmel.
93. *Acanthis linaria linaria* (Linn.)
94. *Spinus pinus* (Wils.)
95. *Plectrophenax nivalis nivalis* (Linn.)
96. *Calcarius lapponicus alascensis* Ridgw.
97. *Passerculus sandwichensis sandwichensis* (Gmel.)
98. *Passerculus sandwichensis savanna* (Wils.)
99. *Zonotrichia leucophrys gambeli* (Nutt.)
100. *Zonotrichia coronata* (Pall.)

101. *Spizella monticola ochracea* Brewst.
102. *Junco hyemalis hyemalis* (Linn.)
103. *Junco oreganus oreganus* (Towns.)
104. *Melospiza melodia rufina* (Bonap.)
105. *Melospiza melodia caurina* Ridgw.
106. *Melospiza lincolni gracilis* (Kittl.)
107. *Passerella iliaca insularis* Ridgw.
108. *Passerella iliaca townsendi* (Aud.)
109. *Piranga ludoviciana* (Wils.)
110. *Hirundo erythrogaster palmeri* Grin.
111. *Iridoprocne bicolor* (Vieill.)
112. *Tachycineta thalassina lepida* Mearns.
113. *Riparia riparia* (Linn.)
114. *Bombycilla cedrorum* Vieill.
115. *Lanius borealis invictus* Grin.
116. *Vermivora celata celata* (Say)
117. *Vermivora celata lutescens* (Ridgw.)
118. *Dendroica aestiva rubiginosa* (Pall.)
119. *Dendroica coronata hooveri* McGregor
120. *Dendroica striata* (Forst.)
121. *Dendroica townsendi* (Towns.)
122. *Oporornis tolmiei* (Towns.)
123. *Geothlypis trichas occidentalis* Brewst.
124. *Wilsonia pusilla pileolata* (Pall.)
125. *Anthus rubescens* (Tunst.)
126. *Cinclus mexicanus unicolor* Bonap.
127. *Nannus hiemalis pacificus* (Baird)
128. *Certhia familiaris occidentalis* Ridgw.
129. *Sitta canadensis* Linn.
130. *Penthestes rufescens rufescens* (Towns.)
131. *Regulus satrapa olivaceus* Baird
132. *Regulus calendula grinnelli* Palmer
133. *Hylocichla ustulata ustulata* (Nutt.)
134. *Hylocichla guttata nana* (Aud.)
135. *Planesticus migratorius caurinus* Grin.
136. *Ixoreus naevius naevius* (Gmel.)
137. *Sialia currucoides* (Bechst.)

GENERAL ACCOUNTS OF THE BIRDS: DISTRIBUTION, MOLT, VARIATION, BIOGRAPHICAL NOTES.

Colymbus holboelli (Reinhardt). Holboell Grebe.

Several seen at Three-mile Arm, Kuiu Island, April 25 to May 6; scattered individuals observed about Prince of Wales Island at Port Protection, Calder Bay, and Sea Otter Sound. These all appeared to be migrants, and they were at all times very wild, usually taking flight when the launch was still several hundred yards distant. None were seen after leaving Heceta Island, May 24.

Colymbus auritus Linnaeus. Horned Grebe.

Although the expedition of 1907 did not observe this species at all in the northern part of the Alexander Archipelago, it proved to be a very common migrant on the bays and channels of the more southern islands. First seen at Three-mile Arm, Kuiu Island, on April 28, and observed daily thereafter in rapidly increasing numbers. It was common at Port Protection, Prince of Wales Island, generally in flocks of six or eight; and, at Calder Bay, at the same island, it was abundant, May 10 to 14. No horned grebes were seen in the open sea nor about the outlying islands (Coronation and Warren), during the ensuing two weeks; and when we returned to the more sheltered waters of Prince of Wales, on May 23, they had apparently all passed on to their breeding grounds. The only subsequent occasion on which the species was observed was at Thomas Bay, on August 22, when a single individual, apparently still in the breeding plumage, was flushed from a little slough on the tide flats.

The horned grebes never attempted to escape by diving, when unwounded, but invariably took to their wings, rising from the water with but little more effort than that exerted by the diving ducks.

Four specimens were secured. A female shot at Three-mile Arm, April 29 (no. 9906) is in complete nuptial plumage, except for some white feathers on the chin and upper breast, which, in this individual, might not be molted at all. Another, taken on April 30 (no. 9907) is but beginning to lose the winter plumage, a few scattered red feathers on the throat, and black ones about the head, marking the beginning of the change. A male secured at Three-mile Arm on May 6 (no. 9908), and another from Calder Bay, May 13 (no. 9909), are both in perfect summer plumage.

Gavia immer (Brünnich). Common Loon.

Fairly common, and apparently generally distributed throughout the Alexander Archipelago. At Kuiu Island, April 25 to May 6, the species was abundant, gathered in large flocks

and feeding on the spawning herring. An adult specimen shot at this point disgorged about two dozen herring. Individuals were seen during the summer at nearly every point visited, and the loud uncanny call peculiar to the species was heard almost daily, so it probably breeds throughout the region, though no nests were found nor young ones observed. Most of the birds seen were feeding, either singly or in pairs, in deep water.

In the large flocks observed early in May the individuals in the plain, immature plumage greatly outnumbered those in adult or summer plumage, and it seems possible that many non-breeding birds retain the winter garb throughout the year. These plain colored birds had conspicuously lighter colored bills than the others; several were pursued and killed, in the belief that they might be *Gavia adamsi*.

Gavia pacifica (Lawrence). Pacific Loon.

A small loon with conspicuously grayish head, presumably this species, was frequently seen, sometimes in numbers, at various places during the summer. At Three-mile Arm, Kuiu Island, they formed a large part of the flocks seen feeding on the herring, and they were subsequently seen in the bays and channels around Prince of Wales and Dall islands, and at various points along Clarence Straits, Frederick Sound, and Stephens Passage.

Gavia stellata (Pontoppidan). Red-throated Loon.

The red-throated loon was positively identified at but very few points. At Kuiu Island a number were seen in the large flocks of loons observed at that place; at San Alberto Bay, Prince of Wales Island, several were seen; and at Duke Island, June 7-9, one or two were heard calling.

Loons of some species were seen from the launch the whole summer through, as we travelled from place to place, but they were invariably very wild, diving when we were still far away, and almost never permitting us to approach within gunshot. Consequently we were frequently quite unable to identify the birds seen.

Lunda cirrhata (Pallas). Tufted Puffin.

Seen only on Warren Channel, where, on May 23, several were observed feeding in the tide rips in the vicinity of Whalehead Island. A single specimen secured here at this time (no. 9917, female) is in a peculiar stage of plumage, considering the time of year. It is a bird of the previous year at least, but evidently was not breeding. It was extremely emaciated, suggesting the possibility of its diseased condition causing some irregularity in the molt.

In appearance this bird is as follows: Above glossy black. Sides of head and neck, throat, upper breast, and sides, slaty black, this area rather sharply defined against the lighter colored ventral surface. Lower breast and abdomen white, the feathers tipped with slate gray, a few scattering ones tipped with dull black. Flanks and crissum, slate gray. Lower tail coverts black tipped. On the side of the head there is a line of exceedingly narrow, plume-like feathers (no longer than the rest of the plumage however), dirty whitish in color, beginning just over the eye, and extending backward 35 mm. The bill, in size and shape, is practically like the illustration of the juvenal in winter figured by Stejneger (1885, plate II, fig. 3).

As seen from the above description, the general appearance of this bird (except for the bill) is much like that of some examples of *Cerorhinca monocerata.*

Cerorhinca monocerata (Pallas). Rhinoceros Auklet.

This species does not seem to venture farther into the sheltered channels than the swell of the open sea extends; we saw it only along the coasts of the more exposed western islands. Two were seen off Cape Decision, Kuiu Island, on May 18, a number were observed in Warren Channel on May 19 and 23, and they were quite common along the west coast of Dall Island, June 4 to 6.

Three specimens were secured (nos. 9903-9905), all in full breeding plumage.

Synthliboramphus antiquus (Gmelin). Ancient Murrelet.

Quite common in a few places on the west side of the islands. Large, scattered flocks were encountered feeding in the tide rips in Warren Channel (between Warren and Kosciusko islands) on May 19 and 23; many were seen in various bays on the northwest coast of Dall Island, May 30 to June 4, as well as in the open sea all along the west coast of Dall Island. On June 6 we passed through numerous flocks at the northern extremity of Dall Island, where they were feeding in the swift-running water of the extremely narrow channel at that point; also at Cordova Bay, at the southern extremity of Prince of Wales Island. On June 7, while crossing Clarence Straits between Prince of Wales and Duke islands, more were observed than at any other place, but as soon as the sheltered waters about the latter island were reached they were no longer to be seen. The preference evinced for the open sea was very marked, and not a single individual was seen at any time in the sheltered waters of the inner passages.

On June 7, while we were passing through numerous large flocks, the sea was unusually clear and smooth, and by standing in the bow of the launch, I had frequent opportunity to observe how the murrelets used their wings under the water. When diving they make a sudden flirt of the wings that can be seen at quite a distance, but it was not until several individuals had passed close under the boat that I could see, as was plainly apparent, that they used their wings continually. They were literally flying under the water, but the manus was held about parallel with the body, and not outstretched, as when going through the air.

Though we were quite unable to discover where the nesting grounds were located, this bird was evidently breeding somewhere in the vicinity of Dall and Prince of Wales islands; for most of the females secured had laid their sets, as was apparent from the condition of the oviduct, while these females and also the single male secured, had each two denuded spots on the abdomen, the size and shape of an egg, evidently for the reception of the two eggs during incubation.

The nine specimens secured (nos. 9891-9899), eight females and one male, vary a great deal in plumage, principally in the markings about the head and neck. A breeding female (no. 9899) has hardly a trace of the slender white plumes on the sides of the head and neck, and while the outline of the black throat patch is indicated, it is composed more than half of white or gray-tipped feathers. There are but a few scattered glossy black feathers in the ashy gray sides and flanks. But two in the series (nos. 9892, 9895) are in what appears to be perfect nuptial plumage, the others being variously intermediate between the extremes.

Brachyramphus marmoratus (Gmelin). Marbled Murrelet.

By far the most common and most universally distributed species of water bird met with in the region. It was seen, frequently in large numbers, practically everywhere we went, except out on the open sea. Here, where the ancient murrelet appeared, the present species was lost sight of, and it seems evident that, in some respects, the requirements of the two species are totally different.

Three specimens were secured. A male shot on Frederick Sound, April 10 (no. 9900), still retains the winter plumage in its entirety, and other gray-colored individuals were seen as late as May 23, though some of these may have been young birds. An adult male taken at the southern extremity of Kuiu Island on May 18 (no. 9901), is still entirely in the winter plumage; but on dissection it proved to be a non-breeding bird, and, further the left carpus had been broken, and though the bone had healed perfectly the bird was greatly emaciated; it is possible that its general health had suffered so that it did not go through the molt at the usual time. The third specimen, also an adult male, taken in Sea Otter Sound, Prince of Wales Island, on May 23 (no. 9902), is in perfect summer plumage, the dorsal feathers being so broadly tipped with chestnut as to cause the back to appear almost uniformly of that color.

Cepphus columba Pallas. Pigeon Guillemot.

This species was generally distributed throughout the region explored, but except in one or two favored localities did not

appear to be at all common. More were seen in the vicinity of Shakan and Calder Bay, Prince of Wales Island, May 10 to 14, than at any other one point. The birds were in loose, widely scattered flocks, though some pairs were observed. Many appeared to be still in the winter, or gray plumage. Pigeon guillemots were seen at most of the points we visited, but usually there were not more than a pair or two in a bay or harbor.

Uria troille californica (Bryant). California Murre.

The only place where any murres were seen was along the west coast, and about the north end, of Dall Island, May 30 to June 6. Here they were fairly abundant, feeding in the turbulent waters near the shore, and doubtless breeding on the rugged rocks and ledges that line this inhospitable coast. Like the ancient murrelet this species appears to shun the more sheltered straits and channels between the islands, and except for a few individuals seen at the north end of Dall Island, just inside Meare's Passage, none were noted in any of the inner channels.

Larus glaucescens Naumann. Glaucous-winged Gull.

This, the most common gull of the region, was generally distributed and seen in numbers practically everywhere. Large flocks followed in the wake of the steamer on the way north from Seattle in the spring, and again going south from Juneau in the fall. During the summer there was hardly a day when individuals were not seen, and in some localities they were gathered in enormous flocks, frequently in company with other species of gulls. Sometimes, out in the broad channels, a flock would be encountered feeding on schools of herring or other small fish; or at times, as at Bradfield Canal, Zarembo Island, and Thomas Bay, flocks of hundreds would be gathered on the mud flats at low tide.

Fewer were seen from about the middle of May to the end of July—presumably the breeding season—than at any other time, and it seems probable that the principal nesting grounds of the species lie somewhere outside the region we traversed. No breeding colony was discovered, and apparently many of the

birds seen during the summer were non-breeders; for individuals, distinguished by some peculiarity of color or form, were known to stay in the vicinity of a camp day after day without wandering off to any great distance.

Individuals seen at Zarembo Island, Mitkof Island, and Thomas Bay, from the middle of July to about the end of August, were in the midst of the molt, and were very ragged in appearance.

Larus argentatus Pontoppidan. Herring Gull.

Evidently not a common species, and seen at but a very few points. Several individuals were observed following the steamer from time to time between Seattle and Juneau, April 4 to 9, and others were seen in the harbors at Ketchikan, June 15, at Wrangell, July 26, and at Juneau, September 2 and 29. These were all birds in various stages of the immature plumage, and they were nearly all ragged and dirty in appearance. On the Taku River, September 4 to 28, a flock of gulls, including about a dozen of this species, remained around an Indian fishing camp by the river, where they shared with the crows and ravens the refuse thrown out.

Larus brachyrhynchus Richardson. Short-billed Gull.

In going north in the spring the short-billed gull first appeared about the steamer while we were crossing Queen Charlotte Sound, on April 6, and from then on until Juneau was reached many individuals remained in the wake of the boat. At Three-mile Arm, Kuiu Island, April 25 to May 6, the species was more abundant than at any other point visited; in fact it was subsequently observed at but few places and in very limited numbers. It was next seen at Bradfield Canal, July 18 to 26, where it was fairly common, feeding on the tide flats in company with *Larus glaucescens* and *L. philadelphia*. On the beach at Mitkof Island small numbers were feeding on the mud in the same association. At Thomas Bay, August 13 to 23, short-billed gulls were fairly abundant, but the birds seen were very ragged in appearance, evidently in the midst of the post-nuptial molt.

One specimen was preserved (no. 9918), a female shot at Three-mile Arm, Kuiu Island, on April 26. It is not in the adult summer plumage, but in the stage described by Coues as "approaching maturity" (1903, p. 991), with all but the first two primaries lacking the white sub-apical spot, the "mantle" of a paler blue, and many of the lesser wing coverts edged with gray or brownish. It is undergoing molt about the head and throat.

Larus philadelphia (Ord). Bonaparte Gull.

First seen at Three-mile Arm, Kuiu Island, on April 30, when a flock of about a dozen passed overhead, flying in a compact body. On the evening of May 3, at the same place, several appeared near the launch, circling about over the surface of the bay. Their manner of feeding is to fly slowly back and forth, some three or four feet above the water, frequently dipping down and picking up something without checking their flight. Many were seen hawking over the water in this manner, and it seems to be characteristic of the species, for I have observed them feeding thus in southern California, and on the lakes in northern Illinois.

It was not met with elsewhere during the spring migration, and was next seen on the evening of June 16, when a large flock was encountered in Behm Narrows, at the north end of Revillagigedo Island. On June 28 a flock of a hundred or more was seen in Behm Canal, between Portage Cove and the mouth of the Chickamin River, and three specimens were secured. All of these birds were in various stages of the immature plumage, and the flock included none with black heads. Scattered individuals were seen on July 4, all along Behm Canal; and, at Bradfield Canal, July 18 to 26, the species was very abundant on the mud flats. From then on it was met with nearly everywhere. On Mitkof Island, August 1 to 13, it was abundant along the beach, in large flocks; at Thomas Bay, August 13 to 23, it was exceedingly abundant on the broad expanse of mud flats exposed by the receding tide; at Port Snettisham, August 24 to September 2, it was seen daily though not in large numbers; and

on the Taku River, September 2 to 28, it was occasionally observed flying along the stream.

The large flocks met with in June, at least, must have been composed of birds that were not breeding that year. They were, as already noted, in the immature plumage, with black barred tail and white head, but they were all evidently birds at least a year old. One specimen (no. 9887, Behm Canal, June 28) has a good many black feathers on the head, and has some of the rectrices pure white and others black tipped. In other words it is about intermediate between the ordinary first winter (immature) plumage, and that of the summer adult, so it may be taken as evidence that, in some cases at least, more than one year is required to attain the perfect adult plumage. This bird is undergoing molt about the head, but the newly appearing feathers are all pure white. The large flocks seen at Bradfield Canal (July 18 to 26) contained many individuals with black heads, and one of these secured (no. 9888, July 22) proved to be in worn nuptial plumage, with, as yet, no indication of the beginning of the post-nuptial molt. Other individuals in the same flocks were in the plumage usually worn by adults in the winter, of which the pure white tail is in life the most conspicuous feature distinguishing it from the immatures. All of this is rather confusing, for in the same flocks, at the same time, were to be seen birds (1) in perfect nuptial plumage, (2) in first winter plumage, and (3) in second winter plumage.

A young female (no. 9889), shot at Mitkof Island on August 4, is in the juvenal plumage, as described by Dwight (1901, p. 56), with brown upper parts (crown, neck and dorsal region), and brownish wash on the sides of the neck and breast. There is a specimen in the Grinnell collection (no. 1345, ♂ Sitka, Alaska; July 21, 1896) in similar plumage but with more brown above, and the brownish wash extending quite across the breast. These dark backed juvenals were seen occasionally at Mitkof Island, August 1 to 13, and they were quite common at Thomas Bay, August 13 to 23; but I have never seen this plumage represented in the flocks that appear on the coast of southern California in the fall; it is probably molted before the birds go south.

Sterna paradisaea Brünnich. Arctic Tern.

A single specimen, an adult female, secured in Bradfield Canal on July 26 (no. 9890). Many arctic terns were seen in Frederick Sound, near Thomas Bay, on August 13; and the species was fairly common at the head of Thomas Bay, August 13 to 23, feeding in company with the numerous gulls seen at this point.

Phalacrocorax pelagicus Pallas. Pelagic Cormorant.

Generally distributed through the region, and in places quite abundant. Probably more were seen about Kupreanof Island, and in the bays and channels on the west side of Prince of Wales Island than anywhere else, but at least a few individuals were observed at nearly every point we visited. At the north end of Kupreanof Island numerous large flocks were encountered on the evening of April 10, flying in to roost on some rocky islets.

Individuals with and without the conspicuous white flank patches were seen throughout the summer, sometimes in the same flocks. The single specimen preserved (no. 7215, Kupreanof Island, April 10) is an adult female in breeding plumage, with large white flank patches. This bird at the time of capture had many long, slender white plumes scattered over the glossy purple plumage of the neck, and some on the interscapulars, but these feathers seemed to be very brittle and easily broken, and in the manipulation necessary to the proper preservation of a greasy skin a large proportion of those on the neck and all on the back, were lost. Of the available specimens in nuptial plumage (five in the Museum collection, and two in the Grinnell collection) but a single bird (no. 1343 coll. J. Grinnell, Sitka, Alaska, July 16, 1896) shows any trace of white plumes on the back. These might be lost in the natural process of abrasion, or else in the preparation of the specimen, but in the freshly killed bird they are very conspicuous, while they are evidently entirely lacking in most museum specimens.

Mergus americanus Cassin. American Merganser.

Though several species were far more abundant in places, there was no other duck so generally distributed throughout the region explored, for American mergansers were seen, in greater or less numbers, at every point we visited. At Kupreanof and Kuiu islands, during April, they were fairly numerous and still in flocks, though at the end of the month they began to pair off. At Coronation and Warren islands (May 12 to 23) pairs of American mergansers were seen daily, while the species was quite common at all the various points touched at along the west coast of Prince of Wales Island between May 6 and 29. At San Alberto Bay (May 24 to 26) a female was several times seen flying into a clump of trees by the water's edge where there were several dead stubs, and in one of these she probably had a nest, though I was unable to find it. Comparatively few were seen along the unsheltered western coast of Dall Island, but when we reached the head of Boca de Quadra, we found them again in large numbers. On the Chickamin River (June 17 to 28) the first broods of young were seen. Later on, during July, flocks of young birds were observed at Revillagigedo, Etolin, Wrangell and Zarembo islands, and at Bradfield Canal on the mainland; while both at Mitkof Island and Thomas Bay (August 1 to 23) the species was fairly common. On the Taku River, during September, many American mergansers were seen flying along the stream, usually in flocks of ten or twelve, each flock probably composed of a single family.

Several interesting peculiarities of the species were noted. On Kuiu Island, April 28 (and on several subsequent occasions) numerous individuals were observed feeding in a manner that was entirely new to me as far as this group of ducks is concerned. I was concealed in the shrubbery at the water's edge examining a large flock of ducks for possible rarities, when a dozen or more mergansers (both *M. americanus* and *M. serrator*) began swimming back and forth but a very short distance from my blind. They swam slowly, with neck outstretched, and with the bill held just at the surface of the water, and at a slight angle, so

that the head was submerged about to the level of the eyes. The water was evidently filtered through the bill, as a slight "gabbling" noise was quite audible, and obviously something was being retained as food, though just what it was I could not tell. This is rather remarkable, as it is exactly the manner of feeding usually employed by the shoveller (*Spatula clypeata*), a species which, as regards bill structure, is further removed from the mergansers than any other member of the Anatidae. In the broad bill of the shoveller the lamellae have developed into a whalebone-like structure, perfectly adapted to the sifting of small objects from the water which is passed through the bill; while in the mergansers they have assumed the appearance and function of teeth, to detain the slippery fish which are the usual food of these birds.

A peculiar habit which made this species quite conspicuous throughout the summer, was that of individuals rising high in the air and circling about for hours at a time, uttering at frequent and regular intervals a most unmelodious squawk. Both sexes were observed doing this, and the habit was kept up until about the end of August.

The numerous broods of young that were seen made their escape, not by diving, but by flapping along the surface of the water, in which manner they progressed somewhat faster than one can row a boat. The mother always herded them in front of her, seldom attempting to take flight unless the danger was imminent. On several occasions an old merganser was seen floating gently down a stream, with may be half a dozen downy young surrounding her, and with three or four perched upon her back.

But one specimen was secured, a young one in the down (no. 7678), on the Chickamin River, June 20.

Mergus serrator Linnaeus. Red-breasted Merganser.

At Three-mile Arm, Kuiu Island, from April 25 to May 6, the red-breasted merganser was fairly abundant, usually in small flocks of from three to six; and on May 11 three individuals were seen at Calder Bay, Prince of Wales Island.

Anas platyrhynchos Linnaeus. Mallard.

By far the most abundant species of fresh-water duck in southeastern Alaska. Flocks of mallards were seen from the steamer in Wrangell Narrows on April 8; and they were exceedingly abundant about Kupreanof and Kuiu islands, April 10 to May 6. At this time the flocks usually frequented the heads of the numerous little bays and inlets, where they were feeding on the fish spawn in the shallow water. A few mallards were seen at Coronation Island, and at the various points visited along the west coast of Prince of Wales and Dall islands; but they were almost invariably single drakes which acted much as though their mates were on the nest somewhere near by. Very few were seen at any of the more southern mainland points visited, and they did not again become common until Thomas Bay was reached. At this place (August 13 to 23), they were abundant, in small flocks of ten or twelve, feeding in the numerous ponds and streams which intersected the meadows and tide-flats in all directions. At Port Snettisham also (August 24 to September 2), mallards were abundant, feeding in tide-flooded meadows, where the grass stood nearly waist high. On the Taku River, in September, a few flocks were seen, but they were not numerous.

Two adult males secured at Kupreanof Island, April 14 and 15 (nos. 9910, 9911) are in perfect nuptial plumage, and present no obvious points of difference from the few more southern breeding birds available for comparison. A male bird, presumably adult (no 9912), taken at Port Snettisham on August 31, is just molting from the summer eclipse plumage. The body is much the same as in other male birds, but the whole head and neck is streaked and speckled with brown with but a few scattered green feathers. Other male birds, shot about the same time but not preserved, were indistinguishable from females in their markings, and the sex could only be determined by dissection. These I took to be birds of the year, still in the immature plumage. Ducks shot at this time were all excessively fat, and as they were also molting, and covered with pin feathers, it was almost impossible to preserve specimens.

Nettion carolinense (Gmelin). Green-winged Teal.

First observed at Kuiu Island on April 28, when they were apparently just arriving from the south. During the following week they increased in numbers daily, and when we left the place (May 6), they were quite abundant, usually seen feeding in company with the mallards at the heads of the bays. The species was not seen again until we reached Thomas Bay on August 13. At this place many small flocks of six or eight individuals were flushed from the sloughs and streams. A few flocks were seen on the Taku River in September, but at this time they were evidently leaving for the south; one was shot as late as September 26.

Two adult females (nos. 9913, 9914), secured at Thomas Bay on August 18, and in newly acquired autumnal plumage, have the under parts slightly stained with rusty, in the same manner as some of the water birds from the Prince William Sound region, as already reported upon by Grinnell (1910, p. 365).

Dafila acuta (Linnaeus). Pintail.

At Kuiu Island, the only place where the species was observed, a few migrating flocks were seen from April 25 to May 6.

Marila marila (Linnaeus). Greater Scaup Duck.

Small flocks of blue-bills were seen at many of the places visited. At Kake Village, on the morning of April 11, several flocks were noted in the bay. At Kuiu Island, April 25 to May 6, some were seen daily, usually in company with the scoters. At Calder Bay, Prince of Wales Island, several flocks were seen on May 11 and 13. A single drake was observed at the head of Marten Arm, Boca de Quadra, on June 14; and, at Thomas Bay, August 13 to 23, one or two flocks were seen feeding in the open waters of the bay.

It may be that *Marila affinis* also was seen, and that both species are included in the above summary, for no specimens were secured at any time. The blue-bills were conspicuously wary and unapproachable, feeding in open water, where there

was no possibility of approaching unseen, and never allowing the launch to come within gunshot.

Clangula clangula americana Bonaparte. Golden-eye.

During the month of April golden-eyes were quite common in the Keku Straits and at Three-mile Arm, Kuiu Island. At Port Protection, Prince of Wales Island, they were seen daily from May 6 to 10, though usually not more than three or four together; and a few were also observed at Calder Bay, May 11 to 13, where one was shot, but not preserved.

The species was not detected again until June 21, when Hasselborg reported seeing an old female with a brood of downy young, at a point ten or twelve miles up the Chickamin River. In an Indian camp at the head of Boca de Quadra I saw some young ducks which the women were keeping as pets, and which may have been of this species. They cannot breed commonly in the region, however, or some individuals would surely have been seen among the numbers of ducks which began to appear toward the end of August.

Charitonetta albeola (Linnaeus). Buffle-head.

During April and May buffle-heads were very common in all the bays and in the more sheltered channels. At Kupreanof and Kuiu islands they were abundant, on Prince of Wales they were seen in numbers at Port Protection and at Calder Bay, and many small flocks were observed about Coronation and Warren islands. After leaving the latter island (May 23) they were no longer seen, nor did any appear during the southward migration in August and September.

The preponderance of males in this species was very noticeable, and nearly all of the small flocks were composed of several drakes and but one or two females. The drakes were constantly exhibiting their plumage and competing for the favor of the females; sometimes when several were fighting together furiously the single female of the flock would quietly fly away and leave them, to be presently followed by the whole gathering as soon as her defection was discovered.

Harelda hyemalis (Linnaeus). Old-squaw.

An exceedingly common species in the spring, during April and May. Several flocks were seen at Kake Village on the morning of April 11, and in the waters about Kupreanof and Kuiu islands old-squaws were in sight almost constantly. Many were also seen about the north end of Prince of Wales Island, at Port Protection and Calder Bay. At the latter place they were particularly numerous, flocks of hundreds streaming past the launch. At Coronation Island they were fairly abundant, and many were seen about Heceta Island on May 23. None were observed anywhere after that date. The loud, peculiar call-note of the old-squaw could be heard from morning to night while the birds were around.

Histrionicus histrionicus (Linnaeus). Harlequin Duck.

Quite generally distributed through the region we traversed, though nowhere as numerous as were some of the other species. About Kupreanof and Kuiu islands it was fairly common, in flocks of eight or ten, and at Port Protection, Prince of Wales Island, it was seen daily from May 6 to 10, though not in great numbers. At Coronation Island many were seen feeding among the rocks at the water's edge, and were very tame and easily approached. The species was probably more abundant at Marten Arm, Boca de Quadra, than at any other point, and here also the birds were noticeably tame. At this time, June 9 to 14, they were all in pairs, but usually two or three pairs seemed to stay together. Here they were generally observed feeding in the swift-flowing streams. A great many were seen at the mouth of Portage Cove, Revillagigedo Island, June 28 to July 4.

Oidemia americana Swainson. American Scoter.

Apparently the least abundant species of scoter in the waters of southeastern Alaska. None were positively identified in the large flocks of sea ducks seen about Kuiu Island, and the species was first met with certainly at Calder Bay, Prince of Wales Island, May 30. They were fairly common about the north end of Dall Island during the first week in June, but after leaving

this place none were observed until we reached Etolin Island, where a few were seen. Many flocks were encountered in Frederick Sound, near Thomas Bay, on August 13.

Oidemia deglandi Bonaparte. White-winged Scoter.

Seen at almost every point visited, sometimes in large numbers. In the channels between Kupreanof and Kuiu islands, during April, they were quite abundant, as also along the west coast of Prince of Wales Island in May; but by the end of May their numbers had greatly diminished. Probably the breeding birds had all gone farther north by that time; the many small flocks seen at various points during June and July were in all probability non-breeding birds. By the end of July they had vastly increased, so that flocks of hundreds were encountered in the channels, and throughout August and September they remained equally abundant.

Oidemia perspicillata (Linnaeus). Surf Scoter.

An abundant species throughout the region. They were exceedingly numerous about Kuiu Island in April, and about Prince of Wales in May. Though some were seen during the summer, they were not abundant and were probably all non-breeding birds, as they remained gathered in flocks. By the end of July their numbers were again on the increase, and in August and September enormous flocks were seen everywhere on the salt water.

At Kuiu Island, about the first of May, they were beginning to pair off, and the courting antics of the males were curious to observe. Vast numbers were feeding close to shore, in the shallow water, and the drakes were continually on the move, flying a few yards and then sliding for eight or ten feet upon the surface of the water, with the wings held stiffly extended above the body.

Chen hyperboreus (Pallas). Snow Goose.

Flocks of white geese, presumably of this species, were seen on several occasions flying high overhead, along the Taku River, September 17 to 28. They were evidently migrating south, and none were seen to alight anywhere in the vicinity.

Anser albifrons gambeli Hartlaub. American White-fronted Goose.

At Kupreanof Island on April 21, and on Kuiu from April 25 to May 6, flocks of white-fronted geese were seen flying northward, their different call-note serving to distinguish them from the hordes of geese of the *canadensis* group which were passing over at the same time. They were all flying high, and none were seen to alight anywhere.

Eranta canadensis occidentalis (Baird). White-cheeked Goose.

An abundant species throughout the summer at practically every place we visited that was at all suited to their wants. At Kupreanof and Kuiu islands, April 11 to May 6, flocks of migrating geese passed overhead daily, and the majority of them appeared to be of this group, while numbers were seen feeding at various places about the islands. None were observed at either Coronation or Warren Island, but all along the west coast of Prince of Wales and Dall islands, in May, they were quite abundant, and nearly all in pairs. One pair was seen on Duke Island, June 7 to 9, and the birds were abundant at the head of Boca de Quadra, June 9 to 14, where they were still gathered in large flocks. A brood of young ones seen by Hasselborg on the Chickamin River, June 21, were about the size of mallards. A few were observed on Revillagigedo Island at the end of June, but the species was not again met with in numbers until Thomas Bay was reached, August 13, probably because the places visited in the meanwhile were but poorly adapted to the wants of the species. Last seen on the Taku, where but few were observed in September.

A single specimen was preserved (no. 9916) an adult female shot at Thomas Bay on August 14. This bird is in the midst of the molt, with many of the tail feathers missing and with many pin-feathers, but it is essentially like the birds secured on Admiralty Island by the expedition of 1907. The tone of coloration of the underparts is somewhat lighter, due to the fact that it is more thinly feathered and the slaty bases of the feathers more exposed, while in full plumaged birds it is the dark tips

of the feathers that produces the general color effect. There is no white half-collar at the base of the neck, and but a few black spots interrupting the continuity of the white cheek patches across the throat.

As Grinnell (1910, p. 373) has already pointed out, the geese of the Sitkan district do not at all accord with the descriptions of *occidentalis* as currently given. It seems evident either that a few abnormal birds have been taken as typical of the form, or else that the geese of southeastern Alaska constitute a race, separate and distinct from the four varieties already recognized by name. *Occidentalis* is said to range "south to California in winter." I have examined hundreds of geese in the California markets, but have yet to see a *large* goose with a white half-collar at the base of the neck, and with a black line dividing the white cheek patches, supposedly the distinguishing characters of this subspecies.

Ardea herodias fannini Chapman. Northwestern Blue Heron.

More great blue herons were seen in the Keku Straits, and on the beaches of Kupreanof Island, April 11 to 24, than at any other place, and probably not more than six or eight birds in all were observed at these points. The species was decidedly rare everywhere else, sometimes weeks passing without a single one being seen. One or two were seen at Port Protection, and several at Klawak Salt Lake, Prince of Wales Island. One was flushed from the banks of a stream at Boca de Quadra on June 11, and a single bird was several times observed at Fool's Inlet, Wrangell Island, July 12 to 18. Two seen flying overhead at Mitkof Island on the evening of August 10, and a single one at Thomas Bay on August 22. They were at all times exceedingly wary and unapproachable, and no specimens were secured.

Grus canadensis (Linnaeus). Little Brown Crane.

The peculiar call-notes of this crane were heard several times at Mitkof Island, between August 1 and 13, usually late in the afternoon, but the birds were not seen. I saw three in some grassy meadows at Thomas Bay, on the morning of August 19.

Lobipes lobatus (Linnaeus). Northern Phalarope.

A single bird shot from the launch at the mouth of Affleck Arm, Kuiu Island, on May 19, was the only one seen during the spring migration. The species was not observed again until August 23, when several small flocks, all in the gray winter plumage, were encountered in the open water of Stephens Passage. On the way south to Seattle, October 1 to 4, many flocks were seen from the steamer at various points in the sheltered waters of the inner passage, all rapidly moving in a southerly direction.

The bird secured (no. 9882) is in freshly acquired summer plumage throughout. The molt has obviously been barely accomplished, for the slaty black feathers of the sides of the neck and the dorsum are finely edged with white, while the tertials and lesser coverts have very broad white edges. These edgings appear to wear off very rapidly, for in other specimens taken about the same time of the year, or but a week or two later, they have entirely disappeared.

Gallinago delicata (Ord). Wilson Snipe.

A Wilson snipe was flushed by Hasselborg at Three-mile Arm, Kuiu Island, on April 26, but was not secured. This was the only bird of the species seen until August 21, when I shot a single specimen at Thomas Bay (no. 9797). On the Taku River, September 4 to 28, snipe were fairly abundant on the flooded, grassy meadows. There were certain favorite spots where they could always be found, but there were vast stretches of country, apparently very similar in appearance, where the birds were never seen. They were, as they usually are, very erratic in their actions; one day all the birds in a meadow taking fright and leaving at the report of the gun, while on the next, perhaps, they would be flushed with the utmost difficulty. Certain aerial gymnasties were gone through daily. These have been described as a part of the mating process in the spring, but this was in September, during the fall migration.

Six specimens were secured at this point (nos. 9798-9803), all in fresh autumnal plumage. The series exhibits no apparent peculiarities of color or proportions.

Macrorhamphus griseus scolopaceus (Say).

Long-billed Dowitcher.

Three-mile arm, Kuiu Island, was the only place where this species was observed, several small flocks being seen from May 3 to 6. Six specimens were secured on May 3, all shot from the same flock. Five of these birds are in almost perfect nuptial plumage, there being but an occasional gray feather here and there over the body; but the sixth (no. 9806) is still almost entirely in the gray winter garb. They were feeding on the mud flats together with large flocks composed of several species of waders, but the dowitchers kept by themselves, and did not mingle with the others. They were quite tame and easily approached.

I cannot see why *griseus* and *scolopaceus* should still be regarded as distinct species, considering the evidence to the contrary (see Ridgway, 1880, pp. 157-160; Howe, 1901, pp. 157-162). As for the six specimens I secured, taken in the heart of the range of *M. scolopaceus*, there is no one character ascribed to the species that holds good through the series; and one or two of the birds (as no. 9808) if shot on the Atlantic coast would probably pass unquestioned as ordinary examples of *M. griseus*. The specific characters of *scolopaceus*, besides the generally larger size and especially longer bill, are supposed to lie in the summer plumage: the deeper toned and more uniform cinnamon color of the lower parts covering the entire belly as well as the breast, while the sides are barred instead of spotted. The most that can be said of these six birds is that none is as small as the minimum measurements given for *M. griseus*. In all there is more or less whitish on the abdomen, some are heavily spotted underneath, the spots extending well down on the belly, and several have the sides distinctly spotted instead of barred.

Altogether it seems to me the height of inconsistency to consider two such closely related forms as *scolopaceus* and *griseus* as distinct species, while, to take a parallel case, *Arquatella maritima couesi* is regarded merely as a race of *A. maritima*. There is apparently far greater possibility of the breeding range of

the two dowitchers meeting somewhere in northern Canada than of the range of the two "varieties" of *A. maritima* touching at any point whatever.

The six specimens of *Macrorhamphus g. scolopaceus* secured measure as follows:

No.	Sex	Wing	Culmen	Tarsus
9804	♀	154	67	37
9805	♀	155	61	36
9807	♀	152	60	36
9809	♀	152	63	35
9806	♂	142	56	35
9808	♂	144	54	35

Arquatella maritima couesi Ridgway. Aleutian Sandpiper.

Very abundant at Three-mile Arm, Kuiu Island, during our stay there, but not seen anywhere else. This is, apparently, the southernmost locality at which the Coues sandpiper has been recorded. In company with the black turnstone and some other waders, they frequented the broad mud flats, which, at low tide, extend over hundreds of acres at this point. As the tide advanced their feeding grounds became more and more restricted, until, as the last available spot was covered, the whole flock departed, with roar of wings, to some jutting rocks at the mouth of the bay, there to remain, preening their plumage and resting, until the receding waters again exposed the mud banks.

The flocks seen at this place comprised many hundred individuals, and it is curious that the species was observed absolutely nowhere else.

The sixteen specimens secured (nos. 9839-9854) are nearly all molting into the summer plumage. Only one or two have quite completed the change, and one or two others have hardly begun to discard the winter garb; in most the winter plumage predominates, with a few chestnut bordered feathers on the back, and black ones on the breast.

Pisobia maculata (Vieillot). Pectoral Sandpiper.

Three were seen and two secured at Thomas Bay, on August 19; and on the 20th a single bird was obtained, possibly the survivor of the previous day. They are all three adults, two of

them (nos. 9811, 9812) in worn summer plumage, with but a few new feathers appearing on the dorsum, the other (no. 9810) in fresh, winter plumage throughout. The only other occasion on which the species was noted was on September 26, when Hasselborg shot one, of several seen, on some grassy meadows on the Taku river. This bird (no. 9813) has also completed the molt into the winter plumage.

Pisobia bairdi (Coues). Baird Sandpiper.

Observed only at Thomas Bay. The first, a single bird, was seen on August 15, and they increased in numbers daily until we left, on August 23. Usually one or two Baird sandpipers would be seen in a large flock of *P. minutilla,* where their larger size made them conspicuous. Their call-note also was somewhat different, enough so to render them easily distinguishable. They were at all times wary and unapproachable, usually taking flight when still far beyond gunshot, though the least sandpipers with which they were associated were indifferent to approach. The six specimens secured (nos. 9814-9819) are all in freshly acquired winter plumage. Some are obviously immature, as was evident from the skull, but none were with certainty adult. There are no color differences apparent between the individuals composing the series.

Pisobia minutilla (Vieillot). Least Sandpiper.

During the first three weeks in May, small flocks were seen at every point visited. The first arrival was noted at Three-mile Arm, Kuiu Island, on May 1, and several small flocks were subsequently seen at the same place. Flocks were observed on Prince of Wales Island at Port Protection (May 6-10), and at Calder Bay (May 12), as also on Coronation Island (May 14-18), and Warren Island (May 19, 20). The species was then lost sight of until July 21, when a single bird was secured at Bradfield Canal. At Zarembo Island, July 27 to August 1, least sandpipers were exceedingly abundant on the tide flats, where they were gathered in flocks of hundreds, and the same was true at Thomas Bay, August 13-23, the last place where they were observed.

Six specimens were secured. Three from Kuiu Island (nos. 9820-9822) and one from Calder Bay, Prince of Wales Island (no. 9823), are in fresh, nuptial plumage; while two from Bradfield Canal (no. 9824) and Zarembo Island (no. 9825) are adults in very much worn nuptial plumage, but not yet beginning to molt.

Pelidna alpina sakhalina (Vieillot). Red-backed Sandpiper.

First seen at Three-mile Arm, Kuiu Island, on April 28, when two birds were secured from a small flock. Several other flocks were subsequently observed at the same place, and three more specimens were taken on May 3. The only other place where the species was encountered was on the beach at Warren Island, where, on May 20, two individuals remained with a flock of western sandpipers, and spent the whole day on the sandy shore just below my tent.

The five birds secured (nos. 9834-9838), four males and a female, are in perfect nuptial plumage, and are very richly colored. The feathers of the black abdominal patch are slightly tipped with white, a mark which would doubtless disappear from abrasion in a very short time.

Ereunetes pusillus (Linnaeus). Semipalmated Sandpiper.

A single example secured at Thomas Bay on August 19. Numerous individuals of what I supposed at the time to be *E. mauri* were seen scattered through the flocks of least sandpipers that swarmed over the mud flats at this point, but this, the only one I shot, is undoubtedly *E. pusillus*. Possibly most, or all, of the other birds observed belonged to the same species.

This bird (no. 9833) is an immature female in first winter plumage, and is indistinguishable from comparable specimens of *E. pusillus* in the Grinnell collection, from the Atlantic coast and northern Alaska. *E. mauri* in corresponding plumage presents obvious color differences, besides the great discrepancy in the length of the bill. This constitutes the first known record of *E. pusillus* on the coast of southeastern Alaska.

Ereunetes mauri Cabanis. Western Sandpiper.

A common migrant in this region, at least in the spring; observed in numbers on Kuiu Island, at the north end of Prince of Wales Island, and on Coronation and Warren islands. The first specimen was taken at Three-mile Arm, Kuiu Island, on April 28, but several small waders, possibly of this species, had been seen at various times shortly before. The last time the species was noted in the spring was at the head of Port Alice, Heceta Island, on May 23. It was not observed in the fall at any time, unless (as mentioned above) it was included in the flocks of small waders seen at Thomas Bay. All seen were in small flocks of twelve or fifteen individuals.

Totanus melanoleucus (Gmelin). Greater Yellow-legs.

First observed on Kupreanof Island on April 18, when two males were secured and others seen. They subsequently became quite common at this point, as they were on Kuiu Island, though never more than two or three were seen together. At this time the males were going through various courting antics, posing with upraised quivering wings, or running in circles on the sand bars, around the object of their attentions, and incessantly uttering the shrill whistle peculiar to the species.

Subsequently seen only at Duke Island, where every evening a pair came flying down to the beach to feed, acting much as though they had a nest in the vicinity; and at Etolin Island, where a single bird was seen on July 10.

Two specimens were preserved (nos. 9858, 9859).

Totanus flavipes (Gmelin). Yellow-legs.

Seen only on one occasion, at Thomas Bay, on the evening of August 13, when a flock of six was observed on the beach, at such short range as to preclude the possibility of error in identification.

Helodromas solitarius cinnamomeus (Brewster).
Western Solitary Sandpiper.

A single bird shot at Port Snettisham, September 1, and another seen but not secured on the Taku River, September

15, were all that were observed during the season. The species is apparently of rare occurrence on the coast of southeastern Alaska.

The specimen secured (no. 9860) has the marbling on the inner web of the outer primary characteristic of *cinnamomeus*.

Heteractitis incanus (Gmelin). Wandering Tattler.

Observed at but very few points. Three were seen and secured at Calder Bay, Prince of Wales Island, May 11 (nos. 9861-9863); and two at Egg Harbor, Coronation Island (nos. 9864, 9865), where several others were noted. The species was next encountered at Mitkof Island, August 10, when a single bird was taken, still in the breeding plumage (no. 9866). A bird in the winter garb was seen at Port Snettisham on August 24.

Actitis macularius (Linnaeus). Spotted Sandpiper.

First observed at Calder Bay, Prince of Wales Island, on May 12, and subsequently met with at most of the points visited. Specific record stations are as follows: Calder Bay, Warren Island, Chickamin River, Revillagigedo Island, Etolin Island, Bradfield Canal, Zarembo Island, Mitkof Island, Thomas Bay, Port Snettisham, and the Taku River. It was everywhere a bird of the beaches and streams, invariably feeding at the water's edge, and was seldom seen on the mud flats frequented by most of the other waders.

At Bradfield Canal (July 18 to 26) a brood of full grown young was seen daily about camp. An adult taken at Mitkof Island on August 10 had not yet begun to molt the summer plumage. On the Taku River, in September, spotted sandpipers were fairly abundant during the first half of the month, but a little later they nearly all disappeared, though one was seen as late as September 27.

Three specimens were secured, one from Portage Cove, Revillagigedo Island (no. 9855), one from Etolin Island (no. 9856), and one from Mitkof Island (no. 9857), all adults in breeding plumage.

Squatarola squatarola (Linnaeus). Black-bellied Plover.

A small flock was seen by Hasselborg on the mud flats at Three-mile Arm, Kuiu Island, on May 3, but none were secured. The species was not met with again until September, when small flocks and scattered individuals were noted on the flooded meadow land along the Taku River. Two secured on September 26 (nos. 9880, 9881) are in freshly acquired winter plumage.

Aegialitis semipalmata (Bonaparte). Semipalmated Plover.

One of a pair was secured on Coronation Island, May 15, and on the following day a small flock was observed at the same place. Several were seen on the beach at Warren Island on May 20. The species was not met with again until the beginning of the fall migration. At Zarembo Island, July 27 to August 1, it was abundant on the mud flats, in small companies of from two to six individuals together with much larger gatherings of least sandpipers, and at Thomas Bay it was very numerous, and in the same association. Three specimens were preserved, two from Coronation Island (nos. 9877, 9878) and one from Zarembo Island (no. 9879), all adults in summer plumage.

Aphriza virgata (Gmelin). Surf-bird.

Seen only at Three-mile Arm, Kuiu Island. At this point, from April 25 to May 6, it was abundant and in large flocks, feeding in company with the numerous other waders frequenting the mud flats.

Of the seven specimens secured here (nos. 9870-9876), six are in nearly perfect nuptial plumage. In one (no. 9874) there are many pin-feathers on the dorsal region and the chestnut marked scapulars of the summer plumage are but beginning to appear. Most of the birds secured have some of the plain colored winter feathers interspersed through the plumage of the breast, but as specimens in the Grinnell collection, taken at Sitka in late summer are in the same condition, it seems as though such old feathers are sometimes carried through to the post-nuptial molt.

Arenaria melanocephala (Vigors). Black Turnstone.

In common with several other species of waders, the black turnstone was observed only at Three-mile Arm, Kuiu Island. At this place it was abundant, nearly half of the immense flocks of waders on the mud flats being composed of this species. It is a very noisy bird, at least when gathered in such large companies, the individuals keeping up a continuous, querulous chatter while feeding, which swells to an excited outburst as the flock takes flight.

At this time (April 25 to May 6) they were just finishing the prenuptial molt, and the three specimens preserved (nos. 9867-9869), as well as others that were shot and not saved, all show some pin-feathers on the head, neck, and breast, as well as many old, brown feathers scattered over the same areas.

Haematopus bachmani Audubon. Black Oystercatcher.

We found the black oystercatcher only on the exposed, western border of the archipelago, and it is apparently entirely absent from the more sheltered inner passages and channels. The record stations for the present expedition are as follows: Kuiu Island, one pair; Coronation Island, several pairs; Warren Island, several pairs; south end of Prince of Wales Island (near Mexico Point), one heard calling; Duke Island, one heard calling. A pair secured at Egg Harbor, Coronation Island (nos. 9883, 9884).

Dendragapus obscurus fuliginosus (Ridgway). Sooty Grouse.

One of the interesting results of the season's work was the more definite determination of the distribution of this grouse in southeastern Alaska. (See text figure 2, page 155.) In general terms it may be said to be absent from those islands lying south of Sumner Straits and west of Clarence Straits, while it is generally distributed over all the other islands and along the mainland coast. We obtained specimens or saw birds at Kuiu, Kupreanof, Mitkof, Coronation, and Etolin islands, and at Boca de Quadra and Thomas Bay on the mainland. It probably occurs also on Revillagigedo and Wrangell islands, though we

did not meet with it at the points visited. It is entirely absent from Prince of Wales and the adjacent islands to the westward (with the single exception of Coronation), and also from Zarembo Island.

This peculiar distribution is hard to account for, as the channels separating these islands from their grouse-inhabited neighbors are no wider than many of those separating the latter from the mainland or from one another, and can hardly be considered as effective barriers to such a strong flying species. For example, the channel between Zarembo and Etolin islands is barely two miles wide at one point; and a grouse could pass from Kupreanof to Prince of Wales without crossing more than three miles of water at one flight. As the broad Chatham Strait is no barrier to the dispersal of the species in the more northern islands of the group, these narrow channels, studded with little islets, can hardly act as such. The species occurs on the rather isolated Coronation Island, which was probably reached by way of Kuiu. The fact that most, or all, of the larger islands from which the sooty grouse is absent, are inhabited by a species of *Canachites,* is, of course, suggestive; but even if one species is able to occupy an area to the exclusion of the other, these narrow channels still would be no obstacle to the distribution of the dominant race. It seems to hold true, however, in the islands of southeastern Alaska, that wherever one species of grouse is found the other is absent.

On Kupreanof and Kuiu islands, in April, the sooty grouse was abundant, while the peculiar habits of the male birds rendered it quite conspicuous. At this time the males remain in the hemlock trees, feeding on the foliage, and sometimes not leaving a tree for days at a time. They hoot continually, at short intervals, a sound that can be heard for a considerable distance, and an unfailing indication of the presence of the species. The tameness, not to say stupidity, of these birds is such that they may be approached without any precaution whatever, for they continue hooting in absolute indifference to observation, and sometimes even remain perched after being shot at and missed. Some individuals sitting at too great a height to be reached by a shotgun could not be dislodged in any way. The

hooting habit continued until about the middle of August, but after the middle of July the sound was heard but rarely. The females seem to stay more on the ground, though, of course, if they were in the trees they would be easily overlooked, keeping silent as they do. The males are said also to descend to the ground in the fall.

A young bird molting into the juvenal plumage was taken on Etolin Island on July 8. On Mitkof Island, in August, several broods of half grown young were seen, sometimes in the woods, and sometimes feeding in the beach grass. They were tame and could hardly be forced to fly. Nine specimens of the sooty grouse were preserved, including three adult males and two adult females (nos. 9787-9791), one young one molting from the natal to the juvenal plumage (no. 9792), and three in juvenal plumage (nos. 9793-9795).

Canachites franklini (Douglas). Franklin Grouse.

We did not ourselves meet with this species at any point, and most of the information secured regarding it was derived from various store-keepers, prospectors, and Indians. On Prince of Wales Island we received information from many people in regard to the occurrence of the "spruce grouse," and as *Canachites franklini* has been recorded from this island by Osgood (1905, p. 70), this is undoubtedly the bird referred to. Hasselborg occasionally reported finding shed feathers or droppings that probably pertained to this species, but neither of us was fortunate enough to see one of the birds. On Warren Island also similar evidence was found. On Zarembo Island we were told by two prospectors that the spruce grouse occurred, but not the sooty grouse, and Hasselborg saw a hunter carrying one of the former.

Judging from the information at hand the Franklin grouse occupies an isolated area in southeastern Alaska, as we were not able to learn of its occurrence on any of the islands immediately adjacent to the mainland. Of course the evidence is only negative, but this is a point in regard to which I made careful inquiry wherever opportunity offered. I also failed to find any island on which the sooty and the Franklin grouse were both known to occur. The hooting habit of the former

makes it so conspicuous that it is hardly possible to overlook the bird if even moderately abundant. Wherever we were told of the occurrence of the Franklin grouse no hooting was heard, while on those islands where *C. franklini* is not known to occur it is one of the commonest sounds in the woods.

Lagopus rupestris dixoni Grinnell. Dixon Rock Ptarmigan.

The only place where any ptarmigan were observed was at Port Snettisham, where Hasselborg flushed two flocks while hunting mountain goats in the higher mountains. He secured one on August 29 (no. 9796). This is a young bird, largely in the stage designated by Dwight as the "first winter plumage (preliminary)" (1900, p. 160). Patches of the juvenal plumage persist on the sides of the abdomen and on the flanks. On the center of the abdomen and on the sides the pure white winter feathers are growing out. There are some white feathers on the legs and toes, and the flight feathers are white, all but the third remex, as are the greater and lesser coverts. Head, breast, back, and median coverts are barred and mottled with dusky, brown and black.

While no specimens of *Lagopus rupestris* from the interior of Alaska, in comparable plumage, are at hand, this bird is so exceedingly dark colored as to suggest the probability of its belonging to the island race designated by Grinnell (1909, p. 207) as *Lagopus dixoni*. This form may prove to occupy the whole of the mainland coast region, as well as certain of the adjacent islands, the conditions being practically the same as on the island where the type specimen was taken.

We were told by an Indian that there were a few ptarmigan on Kupreanof and Kuiu islands, seen usually during the winter months, in all probability a form of the rock ptarmigan. On Prince of Wales Island also we were told that they were occasionally seen on the higher mountains in summer and occasionally in the valleys in winter.

Circus hudsonius (Linnaeus). Marsh Hawk.

An adult male, seen at Three-mile Arm, Kuiu Island, on April 29, was the only individual observed during the spring.

The species was not met with again until we reached the Taku River. At this point during September, marsh hawks were seen daily hunting over the meadows bordering the river. These meadows were thickly populated with meadow-mice (*Microtus drummondi*), which seemed easy prey, for I frequently saw the hawks drop down in the grass, to arise at once grasping a mouse. The stomach of one of the birds secured contained several meadow-mice (*Microtus*) and one jumping mouse (*Zapus*). They resented the appearance of any other birds of prey upon their hunting grounds, and I repeatedly saw them attack bald eagles, as well as a short-eared owl and a rough-legged hawk. Two marsh hawks were preserved, both males in first winter plumage (nos. 9772, 9773).

Accipiter velox (Wilson). Sharp-shinned Hawk.

Seen at various points during the spring and summer, though rare everywhere. On Kupreanof Island, on April 23, Hasselborg found a nest, finished but empty, with one of the old birds near by. On Kuiu Island a sharp-shinned hawk was seen pursuing some sandpipers. Single birds were observed at the following points: Prince of Wales Island (Calder Bay), Coronation Island, Heceta Island, Dall Island, Duke Island, Chickamin River, Revillagigedo Island (Portage Cove), Mitkof Island. At Thomas Bay during the latter part of August they became fairly common, as the immature birds began to appear, moving southward. Several were seen at Port Snettisham, and on the Taku River the species was quite abundant.

They were frequently observed in pursuit of small birds, and several of those secured had the remains of sparrows or juncos in their stomachs, but one (no. 9776) had eaten two shrews.

Six specimens were secured, as follows: adult male, Mitkof Island (no. 9774), adult female, Taku River (no. 9778), immature female, Port Snettisham (no. 9776), immature male, Thomas Bay (no. 9775), and an immature male and female, Taku River (nos. 9777, 9779). The two adults are extremely dark colored, as compared with summer specimens from California, Nevada and Illinois. The male bird (no. 9774, Mitkof Island, August

12) is just finishing the molt into the fully adult, presumably the second winter, plumage, and is more heavily marked than any other example of the species at hand. The lower surface is chestnut, with the transverse barring reduced to disconnected spots, except on the abdominal region; the tibiae uniform chestnut, entirely without barring. The adult female is not quite so heavily marked.

An examination of the available series of sharp-shinned hawks in adult plumage reveals the fact that these two Alaska birds, together with some winter specimens from California, are much darker than other winter specimens from California, as well as those from Arizona, Nevada and Illinois. It seems possible that there is a recognizable, dark, northwest coast race of the sharp-shinned hawk, which in winter ranges at least as far south as southern California, where it occurs together with the paler colored, more southern form; but the material at hand is too scanty to enable me to arrive at any definite conclusions.

Astur atricapillus striatulus Ridgway. Western Goshawk.

On Kuiu Island, April 25, a goshawk was seen pursuing a flock of mallards. The species was not met with again until we reached Thomas Bay, where, on August 14, Hasselborg saw two, apparently fighting, and shot both, but lost one in the thick underbrush. A single bird secured on the Taku River, September 13, completes the list of records. This bird had just finished eating a Steller jay.

The two birds secured (nos. 9770, 9771), both males in the first winter plumage, are extremely dark colored dorsally, and heavily marked with black on the lower surface, being exactly similar to the single specimen secured on Baranof Island by the 1907 Expedition (see Grinnell, 1909, p. 211). It is interesting to note, however, that a bird in the Grinnell collection, also in immature plumage, collected at Sitka, August 5, 1895 (see Grinnell, 1898, p. 127) is apparently to be referred to *A. atricapillus atricapillus*, as it is indistinguishable from specimens of the latter from the Yukon Valley, Alaska.

Buteo borealis alascensis Grinnell. Alaska Red-tailed Hawk.

Apparently not common in this region, as we noted the species

at but two localities: At Duke Island, June 7, an adult, with the red tail, was seen circling overhead, and on the Chickamin River, June 18, Hasselborg shot one of several seen in the vicinity of a colony of marmots.

The bird secured (no. 9769) is a male in the light phase of the immature plumage, and was apparently not breeding, though it is a bird of the previous year at least. In its small size it bears out one of the characters upon which the subspecies *alascensis* was based; but in coloration and markings I cannot distinguish it from comparable California specimens of *calurus*.

Archibuteo lagopus sancti-johannis (Gmelin).

American Rough-legged Hawk.

A large, dark-colored hawk, seen hunting over the meadows along the Taku River, on September 12, is, I believe, to be referred to this species. It was seen several times during the day, but was wild and unapproachable, and was driven from place to place by two marsh hawks who strongly resented its appearance in the neighborhood.

Haliaeëtus leucocephalus alascanus Townsend.

Alaska Bald Eagle.

This, the only bird of prey that is really abundant in the region, is so universally distributed that a list of the stations where it was observed would include every point visited during the season. The numbers seen varied greatly from place to place, the varying food supply being probably the cause of the differences. About San Alberto Bay, Prince of Wales Island, especially large numbers were seen, sometimes forty or fifty being in sight at once, and here they were feeding on the spawning herring. At this point Hasselborg killed a bear, and passing by the place the following day, found about thirty eagles feasting on the carcass. It seems hardly probable that all the birds seen were breeding, for few nests were observed anywhere, compared with the large numbers of the birds encountered. At Kupreanof and Kuiu islands, in April, several occupied nests were seen, but we did not disturb them. By the middle of July young

birds were met with wherever we went, tame and unsuspicious as a rule, and easily approached. Early in August the old birds began to molt, becoming very ragged, and showing gaps in wings and tail as they circled overhead.

Falco columbarius columbarius Linnaeus. Pigeon Hawk.

At Three-mile Arm, Kuiu Island, April 25 to May 6, a pigeon hawk was seen almost daily, and on May 3 Hasselborg found a nest that appeared to belong to this bird, for it remained near by. The nest, empty at the time, was built in a spruce tree, in the angle formed by the junction of a limb with the trunk, and was about thirty-five feet from the ground. This hawk was seen at various times in pursuit of small waders and of robins.

The species was not met with again until we reached Thomas Bay, where, on August 18, a single bird was secured. At Port Snettisham two were shot on August 24 and 27, respectively. On the Taku River pigeon hawks were more numerous, for at least eight or nine were seen during the time we spent there, and one was secured on September 26. One was seen here in the blue-backed, adult plumage, but he was too wary to be approached.

Of the four secured three had the remains of spotted sandpipers in their stomachs, while the fourth contained a finch, probably a *Zonotrichia*.

The four specimens obtained (nos. 9780-9783) are all females, and probably all immatures in their first winter plumage. They are distinctly referable to *columbarius* rather than to *suckleyi*, which might be supposed to be the form occurring in this region. Compared with winter specimens of *columbarius* from southern California they are somewhat darker dorsally, being rather sooty where the latter are earthy brown, but there is little or no difference in the intensity or amount of the dark markings below.

Falco sparverius sparverius Linnaeus.

American Sparrow Hawk.

A female secured on the Taku River on September 16 was the only one of the species seen. This bird was observed at the

edge of the woods, sitting on the top of a little spruce tree, from which it had just driven a pigeon hawk. Its stomach contained a meadow mouse (*Microtus drummondi*).

This is, I believe, the first individual of the species to be taken in the southeastern coast district of Alaska, if not in the entire territory. Bishop has recorded it from the Yukon Valley (1900, p. 75), but within the Canadian boundary, with the exception of Circle, where the species was doubtfully identified.

The specimen secured (no. 9784) is in fresh, fall plumage, and compared with examples from more southern localities is decidedly dark toned, especially on the dorsal surface. The black cross-bars are broad, and the chestnut bars consequently restricted in area, and also very rich colored.

Pandion haliaëtus carolinensis (Gmelin). American Osprey.

Observed at but few points. In Wrangell Harbor, on the evening of July 26, one was seen. At Zarembo Island, July 27 to August 1, a pair of the birds were observed daily. On Mitkof Island, August 9, one was seen passing overhead, and on the Taku River, September 27, one lit on the mast of the launch.

Asio wilsonianus (Lesson). American Long-eared Owl.

A male secured on the Taku River, September 26 (no. 9786), probably constitutes the northernmost record of the species on the Pacific Coast. This bird, the only one seen, was flushed from the tangled roots of a fallen tree, lying half hidden in the long meadow grass on the banks of a stream: a singular shelter to be taken in preference to the many thickets and bushes on all sides.

It is rather dark colored, though not more so than some California birds at hand, but it differs from any specimens available in its extremely small size, being below the minimum measurements as given in literature. It measures: wing 248 mm., tail 145.

Asio flammeus (Pontoppidan). Short-eared Owl.

Seen only on the Taku River. At this point a short-eared owl, probably the same individual, was seen several times on

September 19 and 20, hunting over the meadows along the river. I had several good views of the bird at close enough range to make identification certain, but was unable to secure it.

Cryptoglaux acadica scotaea (Osgood).

Northwest Saw-whet Owl.

One specimen, a juvenal female, Mitkof Island, August 4 (no. 9785), shot just at the edge of the forest bordering the beach. The stomach contained the fur and bones of *Microtus macrurus,* a mouse that was fairly abundant at this point. This bird is molting from the juvenal to the first winter plumage, with new feathers appearing in the pectoral tracts, and many pin-feathers in the facial discs. There can be no doubt, I think, that it is an example of the northwest coast form of *C. acadica,* which Osgood (1901, p. 43) has called *scotaca,* for compared with a juvenal of *acadica* from Illinois, it presents differences corresponding to those distinguishing adults of the two races. The dorsal region, upper surface of wings, and upper breast, are very dark brown, almost bistre, as compared with the vandyke brown of corresponding areas in young *acadica,* the facial discs darkening to clove brown. The cinnamon of the abdominal region is, however, but little darker than in *acadica.* The rectrices are very dark, almost black, but the white spots are not perceptibly diminished in size. The new feathers of the first winter plumage appearing on the sides of the breast are of a distinctly darker shade of brown than corresponding feathers on eastern examples of the species, or even than that of two specimens from Oregon.

Bubo virginianus saturatus Ridgway. Dusky Horned Owl.

Horned owls are apparently of rare occurrence in this region, and we saw but little evidence of their presence. At Three-mile Arm, Kuiu Island, there was more owl sign than at any other point, consisting of a few shed feathers and a number of cast pellets picked up from time to time. These pellets consisted largely of deer hair, from which it would seem that the owls sometimes feed on carrion; dead deer were numerous in the

woods. A horned owl was heard hooting at this point on the evening of May 5. One was also heard at Mitkof Island on the night of August 10, and at Thomas Bay, August 22, Hasselborg saw a large owl in the woods that was probably of this species.

Hasselborg afterward sent in a specimen from Douglas Island on December 20. According to the accompanying notes a friend heard his cat squall in the night, and, going out, found the owl attempting to fly away with it. He killed the bird with a stick. This specimen (female, no. 1065) is apparently to be referred to *saturatus*, as it is quite dark colored, and heavily barred with black underneath. The feet and legs, however, are but very slightly mottled.

Ceryle alcyon caurina Grinnell. Northwestern Belted Kingfisher.

Kingfishers were decidedly rare over the whole of the region traversed, and none at all were seen along the western edge of the archipelago, where we spent April and May. At Marten Arm, Boca de Quadra, June 9 to 14, a pair was observed digging in the gravelly bank of a stream, and on the Chickamin River one or two of the birds were seen, but no nest found. At Bradfield Canal a pair of kingfishers probably had a brood of young near by, for they were continually carrying fish up the stream. At Mitkof Island, in August, several were seen along the coast, evidently migrating, as were others observed at Thomas Bay.

Two specimens were secured, both adult males in freshly acquired winter plumage, no. 9767, Mitkof Island, August 9, and no. 9768, Thomas Bay, August 14. These two birds appear to bear out the characters ascribed by Grinnell (1910, p. 388) to the Alaskan race.

Dryobates villosus harrisi (Audubon). Harris Woodpecker.

The hairy woodpeckers of the Sitkan district exhibit a diversity of characters that is decidedly puzzling. In general there is a tendency to vary from typical *harrisi*, shown in a less marked smoky suffusion of the underparts, together with the frequent presence of conspicuously white-spotted lesser wing

coverts, while some individuals evince a decided leaning toward the characters of *Dryobates v. picoideus*. Such proclivities cannot, however, be correlated with any particular region, the *picoideus*-like examples not being necessarily found closest to the range of that race. For the present at least, it seems best to include all under the form *harrisi*.

The specimens available in the present study are as follows: ten from the 1909 Expedition, *i.e.*, Calder Bay, Prince of Wales Island, one (no. 9735); Egg Harbor, Coronation Island, one (no. 9734), "Rocky Bay," Dall Island, one (no. 9736); Etolin Island, two (nos. 9739, 9740); Boca de Quadra, two (nos. 9737, 9738); Wrangell Island, one (no. 9741); Admiralty Island, one (no. 9319); Chichagof Island, one (no. 10648); three from the 1907 expedition, all taken on Admiralty Island (nos. 462-464); one from the Grinnell collection, collected at Sitka (no. 1246), and two specimens of *D. v. picoideus* borrowed from the Biological Survey collection, one from Skidegate, Queen Charlotte Islands (no. 166821), the other (hardly typical of the form however) from Kasaan Bay, Prince of Wales Island (no. 186243).

Excluding the Queen Charlotte Island specimen, the individuals showing the most marked smoky suffusion on the underparts are from Admiralty and Chichagof islands, at the northern extremity of the region, and from Dall Island, and Kasaan Bay, Prince of Wales Island (the supposed *D. v. picoideus*), at the south. Specimens with this tendency at a minimum, some being nearly as white below as examples of *hyloscopus*, are from Admiralty, Coronation, Prince of Wales, Etolin, Wrangell, and Baranof islands, and from Boca de Quadra.

The presence of conspicuous white spots on the lesser wing coverts is also an unstable character, though such markings are usually evident to some degree. Of two specimens collected at Boca de Quadra, one (no. 9738) has conspicuously white-spotted coverts, while on the other (no. 9737) there are no white spots at all. The one specimen from Dall Island (no. 9736) shows an inclination toward the characters of *picoideus*, evidenced by the restricted area of the white dorsal stripe, together with slight barrings on the back and flanks; but the same peculiarities are evident to an even greater degree in one from Admiralty Island

(no. 462), which is geographically far removed from this race. Altogether it does not seem to me expedient to consider such variants as examples of *picoideus*; for these exceptional individuals are, in some respects, more like typical *harrisi* than are the majority of the birds of this region. Neither do I feel like giving a new name to the Sitkan bird, for, as shown above, the characters that might be ascribed to it (of which the white underparts and white-spotted lesser wing coverts are the most apparent) are extremely unstable.

Harris Woodpecker is quite generally distributed over southeastern Alaska, but apparently is nowhere very common. The first was noted on Kuiu Island, April 30, though the species is probably to be found in the region through the winter. Hasselborg secured one at Freshwater Bay, Chichagof Island, as late as November 2. Single individuals were seen at many scattered points, but the only place where the species was even fairly abundant was at the head of Marten Arm, Boca de Quadra, where it was seen or heard daily. A fully fledged juvenal was secured on Etolin Island, July 6, the first young one seen flying about. It is rather curious that absolutely no Harris woodpeckers were observed on the Taku River, the only point where a form of the downy woodpecker was met with.

Dryobates pubescens glacialis Grinnell.

Valdez Downy Woodpecker.

Observed only along the Taku River. On September 4, the only bright, sunny day we had at this point, they were active and rather noisy, and five or six were seen flying about, calling and rapping on the trees. In the rainy weather that followed they were quiet and inconspicuous, and but very few were noticed.

Two specimens were secured, an adult male, September 13 (no. 9733), and an immature male, September 4 (no. 9732). They agree minutely with Grinnell's characterization of *Dryobates pubescens glacialis* (1910, p. 390); nor am I able to distinguish any differences on comparison with his specimens, except that one of my birds (no. 9733) has somewhat heavier black barring on the rectrices than has either of those from Prince William Sound.

This appears to be a fairly well marked race, easily distinguishable from *gairdneri* or *nelsoni*, whose ranges it adjoins, but curiously similar to *D. p. medianus* of the eastern United States. It is thus comparable with the isolated western "colonies" of *Penthestes atricapillus atricapillus* and *Passerculus sandwichensis savanna*. We are fortunately able to recognize certain slight differences in the woodpecker, and thus in this case avoid the absurdity of calling the variety by the name of a race with which its affinities are doubtless remote.

Picoides americanus americanus (Swainson).

American Three-toed Woodpecker.

A single specimen, a female, collected by Hasselborg at Freshwater Bay, Chichagof Island, November 27 (no. 10649). This bird has not a trace of smoky suffusion beneath, the distinguishing character of the single specimen on which Grinnell (1909, p. 217) based his *Picoides a. fumipectus*, also from Chichagof Island. However, although this specimen is as pure white ventrally as any of a series from the Yukon Valley, it does show a smoky suffusion in the white speckling on the top of the head, while the area of the white dorsal markings is somewhat contracted.

The three-toed woodpecker of the Sitkan district may still prove to be a recognizable form, but the diversity of coloration shown by the two specimens at hand necessitates the examination of additional material to demonstrate the distinctness of the race proposed by Grinnell (l. c). For the present it seems best to consider *P. a. fumipectus* as a synonym of *Picoides americanus* (Swainson). This bird was taken at a time when it may well have been a migrant from some other region. The species was not met with at any time during the summer.

Sphyrapicus varius ruber (Gmelin). Red-breasted Sapsucker.

Generally distributed throughout the region, but nowhere at all common. It was noted at the following points: Kupreanof Island, Kniu Island, Prince of Wales Island (Klawak Salt Lake), Chickamin River, Etolin Island, and Wrangell Island.

On the Chickamin River (June 17 to 28) Hasselborg found three nests at various points some eighteen or twenty miles up the river. All were in high, rotten stubs, and all evidently contained young birds. On Etolin Island a nest was located, also high up in a dead tree, and also containing young.

Three specimens were secured, from Kupreanof Island (nos. 9742, 9743) and the Chickamin River (no. 9744). They are very deeply colored, the red and yellow areas being particularly intense, and in one (no. 9742) the light dorsal markings are reduced to the slightest of yellowish flecks, and the back consequently almost uniform black.

Colaptes cafer saturatior Ridgway. Northwestern Flicker.

Flickers were decidedly scarce in the whole region traversed, and the few individuals met with were so wild as to be approached with the utmost difficulty. More were observed on Kupreanof Island than at any other one place, and here, from April 12 to 24, six or eight were seen or heard. At Rocky Bay, Dall Island, May 31, one was heard calling. On Gravina Island the call note of a flicker was heard on the evening of June 15, and one was secured early the next morning. At Portage Cove, Revillagigedo Island, on July 2, a nest was found, and the pair of birds shot. On Etolin Island, July 5 to 12, a flicker was heard on several occasions, but I was never able to catch sight of it. Single birds were seen on the Taku River, on September 10 and 13, but they were so wild as to be unapproachable.

Four specimens were secured: an adult male at Kupreanof Island, April 16 (no. 9728); an adult male at Gravina Island, June 16 (no. 9729); an adult male (no. 9731), and female (no. 9730) at Portage Cove. No. 9728 may be taken as typical of the race *saturatior*, the upperparts being rich mars brown, as compared with the drab backs of southern California birds, while the black markings are broad and lustrous. The underparts are strongly tinged with vinaceous-pink. No. 9729 is somewhat paler dorsally, though decidedly more pink underneath, and has a slight admixture of *auratus* characters as evidenced by a few black specks in the red malar stripes, and a slight indication of a red nuchal crescent. Nos. 9730 and 9731 were a pair, and

though the female may be considered as typical of *saturatior*, the male shows an almost equal intermingling of the characters of *cafer* and *auratus*. It has the black malar stripes and nuchal crescent of the latter species, with the red quills of the former. The lower parts have an olivaceous tinge, similar to but not so pronounced as in *auratus*, while the colors of the head (gray on the occiput and brown on the throat in *auratus*, and the reverse in *cafer*), have been modified so that the whole head is an almost uniform brownish gray.

The nest found at Portage Cove was in a dead stub, some fifty feet from the ground. The stump was so rotten that an attempt to climb it brought down the whole upper portion, including the nest, in a mass of disintegrated punk. In the debris we found five newly hatched young birds and one rotten egg. The young were far too small to give any indication as to the extent to which the varying characters of the parents would be developed. The nest tree was in a valley bordering a stream, in fairly open country, with clumps of scattered timber interspersed between the open meadows.

The four flickers secured measure as follows:

No.	Sex	Wing	Tail	Culmen
9728	♂	166	111	42
9729	♂	167	117	42
9731	♂	162	113	38
9730	♀	166	106	38

Cypseloides niger borealis (Kennerly). Black Swift.

First seen at the head of Marten Arm, Boca de Quadra. Here during the middle of June the black swift was numerous, large flocks hovering over the meadows in company with Vaux swifts and barn and tree swallows. The swallows fed close to the ground, almost brushing the grass, but the swifts stayed high in the air; and it was only occasionally that an individual would swoop down, affording an opportunity for a hasty, and usually ineffective, shot. Two rainy mornings were devoted almost entirely to an endeavor to secure a series of these birds, and six specimens were obtained. On the following day the weather changed, the sun came out, and the swifts disappeared.

In life its great size alone readily distinguishes the black

swift from the little Vaux swift, with which it was here associated; but the two species differ in many minor respects also. The black swift soars a great deal and flutters its wings comparatively little, is almost absolutely silent, and individuals were seldom seen pursuing one another.

It was undoubtedly breeding somewhere in the vicinity for one of the females secured contained an egg that would have been laid in a few days.

It was met with again at Portage Cove, Revillagigedo Island, where a few individuals appeared nearly every evening at dusk, flying about until dark. It is rather curious that the species was not observed on the Chickamin River, on the mainland directly opposite Portage Cove, the character of the country being very similar to that at Boca de Quadra. At Bradfield Canal Hasselborg saw a large black swift that he supposed was of this species.

Eight specimens were secured, two males and four females at Boca de Quadra (nos. 9360-9365), and two males at Portage Cove (nos. 9366, 9367). The four males are uniform sooty black (save for the paler markings about the head), only one (no. 9366) showing slight whitish tips on the feathers of the abdomen and the lower tail coverts. Of the four females, one is like the males in that it is uniformly black (except for a single pure white feather on the upper breast). The other three have the feathers of the abdomen and the lower tail coverts tipped with white in varying degrees. These white tips probably disappear as the individual becomes older, and when fully adult the sexes are apparently alike in coloration, but from the specimens in hand there seems to be one point in which they constantly differ. The four males have the tail deeply forked; in the four females it is uniformly square, there being no difference in this respect between the black individual and the white marked ones. In the males the tail is so deeply forked that the lower coverts extend beyond the middle rectrices.

I believe that this is the first time that the species has been taken in Alaska.

The eight specimens secured measure as follows:

No.	Sex	Wing	Tail	Extent of forking in tail
9360	♂	162	59.5	8
9362	♂	163.5	62	9.5
9366	♂	163	58	8.5
9367	♂	166.5	61	10.5
9361	♀	161	51	square
9363	♀	165.5	57	square
9364	♀	160	53	square
9365	♀	160	55	square

Chaetura vauxi (Townsend). Vaux Swift.

Although I believe this species has not been previously reported from Alaska we found it at all the mainland points visited, as far north as Thomas Bay. At Marten Arm, Boca de Quadra, it was common. Along the Chickamin River it was, at times, very abundant, and a female shot at this point (no. 9359, June 18) contained a partly formed egg, so that the species was evidently breeding. At Portage Cove, Revillagigedo Island, Vaux swifts were seen occasionally, usually in the evening; while a single bird was seen at Bradfield Canal on July 19. At Thomas Bay, August 13 to 23, the species was very abundant, hovering over the meadows in company with the barn swallows, but they flew high and I failed to get any at this point. Three specimens were secured, two males from Boca de Quadra (nos. 9357, 9358), and a female from the Chickamin River (no. 9359). The latter evinces a tendency toward albinism, shown by two patches of pure white feathers on the lower surface of the body.

The three individuals secured from this the northern extremity of its range are not different from California specimens with which they were compared.

Selasphorus rufus (Gmelin). Rufous Hummingbird.

First seen at Three-mile Arm, Kuiu Island, on April 26, when a male bird was several times observed hovering over a blossoming huckleberry bush by the tent. The species was next met with at Calder Bay, Prince of Wales Island, where a female was seen on May 11, and a male secured on May 12 (no. 9356). From then until about the end of June it was, though not com-

mon, quite generally distributed, and we met with it at nearly all points visited. Specimens were seen at Coronation and Warren islands, and at San Alberto Bay and Klawak Salt Lake, Prince of Wales Island, at Rocky Bay, Dall Island, Boca de Quadra, the Chickamin River, and Portage Cove, Revillagigedo Island. But a single bird was seen on Zarembo Island, and at Thomas Bay, about the middle of August, the species was evidently becoming scarce. The last hummingbird was observed at Port Snettisham, on August 31, a single bird seen several times at the edge of a willow thicket.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher.

Three specimens secured at Thomas Bay, where several others were seen. The first was observed on August 17, and they were subsequently noted daily, evidently migrating. Their habit of perching on the tops of the tallest available trees made them difficult birds to shoot, and it was only by using heavy loads that any specimens were obtained. At Port Snettisham two were seen on August 29, but neither was secured. While the species may breed along the coast of southern Alaska, I do not think it probable that it does, but believe rather that the individuals seen were migrants from some interior region, as were several other species of birds that appeared about the same time.

The three specimens secured are not perceptibly different from others taken in southern California and Arizona. The two adult males (nos. 9707, 9708), taken on August 17 and 20, respectively, are in worn summer plumage, and just beginning the post-nuptial molt, as evidenced by a few new, partly ensheathed feathers on the top of the head and on the dorsum. The third, an immature male in first winter plumage (no. 9709), August 21, compared with others in corresponding plumage from southern California, is actually somewhat paler colored throughout, and with the whitish areas more extensive than in most of the latter. This is a species that is wonderfully resistant to the effects of varying local conditions, specimens from southern California to Alaska, and from the Atlantic to the Pacific, presenting exactly the same appearance.

Myiochanes richardsoni richardsoni (Swainson).

Western Wood Pewee.

Wood pewees were met with at most of the mainland points visited, but on none of the islands. At Boca de Quadra, June 11, one was heard calling on a wooded hillside, but the vegetation was so thick that I was unable to catch sight of the bird. On the Chickamin River probably five or six individuals were seen at various times between June 17 and 28. They appeared to be migrating, and were usually perched on little scrubby willows scattered over the meadow land. I saw no indication that any were breeding at the time; the specimens secured certainly were not. At Thomas Bay the species was frequently seen, evidently migrating southward. The birds were excessively wild, and usually fled to the tops of the tallest trees, where they were far beyond shot-gun range. At Port Snettisham several individuals, possibly six or seven all told, were seen at different times, but here also they were wild and unapproachable. A single bird was seen on the Taku River, on September 8, the last one observed. I had but a glimpse of this bird as it flew over an alder thicket, and failed to find it again.

Three specimens were secured, two adult males from the Chickamin River, June 20 and 22 (nos. 9710, 9711), and an immature female from Port Snettisham, August 28 (no. 9712). While there may well be a recognizable northwest coast form of the western wood pewee, as claimed by Bishop (1900, p. 116), I am unable to uphold it with the scanty material at hand. My three specimens are certainly appreciably darker colored than the breeding birds available from southern California; but there are specimens in the museum collection, taken in June in the northern Sierras, which are indistinguishable in color from the Alaskan birds. In a fairly large series from southern Arizona, some are pale colored, but there are others nearly, if not quite, as dark as those from Alaska. Neither can the size of the bill be depended upon to distinguish them, as there seem to be both large and small-billed individuals in series from all localities. The two Alaskan adults show as much variation in this respect as can be seen in large series from more southern localities.

Empidonax difficilis Baird. Western Flycatcher.

Generally distributed and fairly common, as birds go in this region, but during the breeding season at least, very retiring and hard to find. The sharp, two-syllabled whistle was frequently heard, but the author of it was seldom seen. First noted on Coronation Island, on May 15, and subsequently observed, evidently migrating, on Warren Island, Heceta Island, and at San Alberto Bay and Klawak, Prince of Wales Island. On the west coast of Dall Island, the first week in June, they appeared to be in pairs, and were seen pursuing one another through the tree tops. On Duke Island they were fairly abundant, judging from the frequency with which the call-note was heard. At Boca de Quadra the species was uncommon, but on the Chickamin River a number were seen, and an incubating female secured on June 26. Small numbers were seen at Portage Cove, Revillagigedo Island, at Etolin Island, and Bradfield Canal. At Zarembo Island the species was far more abundant than at any other place visited, this being partly due, perhaps, to the fact that at this time the young birds had left the nests and were beginning to appear in the woods. At Mitkof Island several were seen, as also at Thomas Bay. At this time they were evidently rapidly moving southward. Very few were observed at Port Snettisham, the last being seen on August 29. The species was not seen at all on the Taku River.

Fourteen specimens were collected, from the following localities: Dall Island, one (No. 9714), Duke Island, one (no. 9715), Chickamin River, two (nos. 9716, 9717), Revillagigedo Island, one (no. 9718), Etolin Island, one (no. 9719), Bradfield Canal, one (no. 9720), Zarembo Island, five adults (nos. 9721, 9722, 9725, 9727), and two juvenals (nos. 9723, 9724). These birds as far as I can see are absolutely indistinguishable from specimens taken in southern California and Arizona.

Empidonax trailli alnorum Brewster. Alder Flycatcher.

A single bird, an adult male, secured on the Chickamin River, June 21. At least one other, possibly the mate of the bird shot, was seen on various occasions up to June 28, but it was too wary

to be approached. The vicinity was admirably suited to the needs of this flycatcher, the stream being bordered with broad grassy meadows, interspersed with clumps of willows, and I have little doubt that the birds seen were preparing to breed. This river valley forms a direct and expeditious highway from the interior to the sea, and the alder flycatcher, together with one or two other species, probably reaches the coast by following the stream westward, and not by traveling north along the seacoast.

The specimen secured (no. 9713) is distinctly referable to the subspecies *alnorum*, having the yellowish flanks and sides, the distinct wing-bars, small bill, and long wing of that race. It is in color and markings practically indistinguishable from a specimen of *alnorum* from the Prince William Sound region, Alaska (see Grinnell, 1910, p. 392), and is very similar to other specimens at hand from Maine and the Mississippi Valley.

Pica pica hudsonia (Sabine). American Magpie.

Met with only on the Taku River. No magpies were seen during the first part of our stay at this point, but on September 14 a single bird was secured, and shortly after the species became fairly common. They were apparently migrating from the interior toward the coast, sometimes flocks of eight or ten individuals being seen passing overhead. The camp was an evident attraction to them, and one or more were frequently seen foraging in the refuse.

The two specimens secured (nos. 9765, 9766) are immatures in first winter plumage, with a few juvenal feathers still lingering on the lower abdomen. They show no trace of the dusky suffusion below, apparent on the juvenals from the Prince William Sound region (see Grinnell, 1910, p. 393).

Cyanocitta stelleri stelleri (Gmelin). Steller Jay.

Throughout the spring and in the early part of the summer jays were decidedly rare at every point visited. On the Kake Islands, in April and early May, but three or four individuals were seen. Single birds or an occasional pair were observed at most of the localities visited on Prince of Wales, Dall, and others

of the more southern islands; but not until the middle of July, when the young birds began to appear in the woods, was the species at all abundant. It was most numerous at Mitkof Island, early in August, when old and young together, in scattering troops of a dozen or more, were encountered along the streams and in the more open places in the woods. Two males were shot at Boca de Quadra June 11 which were evidently keeping together, and on dissection they proved to be non-breeding birds.

A young bird, nearly full grown but in the juvenal plumage throughout, was taken on Etolin Island on July 7 (no. 9756). Another, with patches of first winter plumage appearing in the pectoral tracts was secured on Mitkof Island, August 10 (no. 9758). An adult from the latter locality, August 4 (no. 9757) is in the midst of the post-nuptial molt, with little of the old plumage remaining, but with many of the new feathers but partly grown out. An immature male from the Taku River, September 9 (no. 9759), is in the first winter plumage throughout, but with only two rectrices. As these are grown out to their full length and the others entirely absent, this was probably due to an accident, and does not represent the normal molt.

Although the subspecies *carlottae* is stated (Osgood, 1905, p. 70) to occur in the southern part of Prince of Wales Island, I must confess my inability to distinguish two forms in the material collected. Some individuals taken south of Sumner Straits certainly do exhibit an extreme of dark coloration, with the color of the blue areas somewhat intensified, and might possibly be considered to represent the more southern race; but the differences are very slight. On the whole the jays collected show no tangible points of difference, either among themselves or compared with other series in the Museum collection, from the northern part of the Alexander Archipelago or from Prince William Sound, and I have no alternative but to include them all under the form *stelleri*. Though *carlottae* is alleged to be larger than *stelleri*, the published measurements show but trifling differences (cf. Ridgway, 1904, pp. 351-354); but even so, none of my specimens exceed the minimum dimensions ascribed to *carlottae*, and are thus well within the range in size of true *stelleri*. The differences distinguishing the two forms are slight, at the best, and any

attempt to account for individual extremes of the latter by referring them to *carlottae* and thus extending its range into the southern part of Prince of Wales Island, is, it seems to me, bound to cause confusion.

Two mainland specimens from Boca de Quadra (nos. 9755, 9761) are quite as dark above as any from Prince of Wales, while others from Dall Island (no. 9752) and San Alberto Bay, Prince of Wales Island (no. 9750) are indistinguishable from specimens from Admiralty Island and other more northern points.

Seventeen specimens of the Steller jay were collected, as follows: Kupreanof Island, three (nos. 9745-9747), Coronation Island, one (no. 9748), Heceta Island, one (no. 9749), Prince of Wales Island, Calder Bay, one (no. 9760), San Alberto Bay, one (no. 9750), Klawak, one (no. 9751), Dall Island, three (nos. 9752-9754), Etolin Island, one (no. 9756), Mitkof Island, two (nos. 9757, 9758), Boca de Quadra, two (nos. 9755, 9761), and the Taku River, one (no. 9759).

Corvus corax principalis Ridgway. Northern Raven.

Seen at every point we visited, sometimes in considerable numbers. They were usually quite tame, and made no effort to get far out of our way, while at several of our camps the ravens visited us daily for the purpose of carrying off refuse—the bodies of skinned birds and mammals, or the scraps trimmed from bear or deer skins. From the actions of some of the birds seen on Kuiu Island the first week of May, and at Klawak Salt Lake, Prince of Wales Island, towards the end of the same month, I judged them to have nests near by, containing eggs, or more probably young, but I was unable to find them. At Etolin Island, July 5 to 12, a brood of noisy young ones hovered about the camp daily, the old ones assiduously feeding them on the scraps I threw out, a process accompanied by gasping, choking, and gurgling noises.

One specimen of the northern raven was preserved, a juvenal female, Etolin Island, July 8 (no. 9762). This bird is just molting from the juvenal into the first winter plumage, with lines of glossy black feathers appearing in the pectoral tracts, on the throat, and on the top of the head.

Corvus brachyrhynchos caurinus Baird. Northwestern Crow.

A common species nearly everywhere, though seldom seen far from tide water. It was noted at the following points: Kupreanof, Kuiu, Prince of Wales, Coronation, Warren, Dall, Duke, Revillagigedo, Etolin, Wrangell, Zarembo and Mitkof islands, and at Boca de Quadra, Chickamin River, Bradfield Canal, Thomas Bay, and the Taku River, on the mainland. Curiously enough the species was not seen at all at Port Snettisham.

At Three-mile Arm, Kuiu Island, a colony occupied a small island in the bay. They vigorously resented the appearance of any raven or eagle in the vicinity, the whole flock turning out to battle with the intruder, who was always glad to beat a hasty retreat. At Marten Arm, Boca de Quadra, a colony of about fifteen pairs of birds occupied an isolated clump of spruce trees, about an acre in extent, in the midst of meadow land. The nests were built at varying heights, from thirty feet up, and were usually placed on a large limb, and against the trunk of the tree. At this time—June 9-14—they were all occupied by young birds. At Portage Cove, Revillagigedo Island, at the end of June, many young birds were out flying around, but still attended by their parents.

At Etolin Island crows were excessively abundant along the beach. Here they were continually observed feeding on clams in the manner already reported by Dixon (see Grinnell, 1909, p. 222), flying in the air with the mollusc so as to drop it on the rocks and break the shell.

At Bradfield Canal they were common, and many old nests were observed in a corner of the woods. On the Taku River in September the species was abundant, and at this time gathered in large flocks, sometimes of a hundred or more individuals.

Two specimens of the beach crow were collected, an adult male from Boca de Quadra, June 12 (no. 9763), and a juvenal female from Etolin Island, July 6 (no. 9764).

Euphagus carolinus (Müller). Rusty Blackbird.

Hasselborg reported a single specimen seen at Freshwater Bay, Chichagof Island, on November 25. He is familiar with the

species and I have no hesitation in accepting his identification. On the morning of April 6 while the steamer on which I was traveling north lay at anchor, storm bound, in a little cove at the southern end of Queen Charlotte Sound, a large flock of blackbirds, possibly of this species, was observed feeding along the rocky beach some hundred yards distant.

Pinicola enucleator flammula Homeyer. Kadiak Pine Grosbeak.

Apparently very rare in the region traversed. Two single, bright-plumaged males were seen on the Chickamin River and at Portage Cove, on June 23 and July 3, respectively. In each case the bird was sitting in a tree top, singing, and was too shy to permit a near approach. Hasselborg secured an adult female at Bradfield Canal, on July 25 (no. 9546). The single bird obtained is similar in color and proportions to specimens in the Museum collection from other parts of the Sitkan district, and from the Prince William Sound region, and, together with these, is referable to the subspecies *flammula*.

Loxia americana sitkensis Grinnell. Sitka Crossbill.

Red crossbills were not observed at all during the early part of the season, when the white-winged was seen, but they first appeared about the end of May. Hasselborg saw a flock on Warren Island, on May 20, and several flocks were seen near Klawak, Prince of Wales Island, a week later. None were observed on Dall Island, but several single birds were seen on Duke Island, and flocks at Boca de Quadra, the Chickamin River, Portage Cove, and Etolin Island. At Zarembo Island the crossbills were more numerous than at any other point, some in pairs but many in small flocks. The males were in full song at this time, and all were very restless, flying about continually. A few were seen at Mitkof Island, at Thomas Bay, and Port Snettisham, but none on the Taku River.

Though observed at so many points, sometimes in comparatively large numbers, I found it practically impossible to collect specimens, as the birds seen were almost invariably flying high overhead or else perched in the tops of the tallest trees. I

secured one, an adult female, at the Chickamin River, June 19 (no. 9545), out of a large flock.

As I have not at hand any additional material—nor even as much as Grinnell (1909, p. 223) had when he described the race *sitkensis*—I do not feel qualified to argue very strongly either for or against the recognition of this subspecies, though with his Alaskan specimens before me I am quite able to appreciate the points he makes, both concerning the color of the male birds, and the general size of the form. There is this much, also, to be said in support of the naming of a northwest coast race of the red crossbill, that although in size it closely approaches the eastern *minor*, it appears to be separated from the range of that bird by a robust, large-billed form. The crossbills wintering in the Mississippi Valley approach very nearly the variety *bendirei* in size, and are as conspicuously different from the southern Alaska birds as from those of the Atlantic states. It is fair to assume that this is the breeding bird of the interior of Canada, and that the race *sitkensis* is hence completely separated from the form which it most nearly resembles.

Loxia leucoptera Gmelin. White-winged Crossbill.

Apparently mainly a migrant or winter resident in the southern part of the Sitkan district, for none were seen after May 6. On Kupreanof Island, in April, the species was fairly common in flocks in the woods, and on Kuiu Island a little later a few were seen at various times. We left the latter island on May 6, and saw no more white-winged crossbills at any time. Males in fully adult plumage formed but a small proportion of the flocks seen.

Eleven specimens were secured: three adult males in bright red plumage of various degrees of intensity, two from Kupreanof Island (nos. 9535, 9540) and one from Kuiu Island (no. 9544); also one dull colored male from Kuiu Island (no. 9543); and seven females, six from Kupreanof (nos. 9534, 9536-9539, 9541) and one from Kuiu (no. 9542.)

Several of the birds secured appear to have recently accomplished a partial molt, and are in noticeably bright, fresh, plumage, as compared with certain others.

Acanthis linaria linaria (Linnaeus). Redpoll.

On Kupreanof Island, in April, the redpolls were fairly common, in flocks together with the white-winged crossbills. They were shy and restless, moving continually from place to place, and were consequently hard to secure. After leaving Kupreanof, April 24, the species was lost sight of, and was not seen again until August 17, at Thomas Bay, when Hasselborg secured a bird in the streaked juvenal plumage, from a flock of the same species. Were it not for this juvenal I would suppose the species to be merely a winter resident or transient in the region; and the capture of this young bird by no means constitutes a breeding record, as the flock containing it may well have wandered from somewhere in the interior, other birds having begun to move at this time.

Five specimens were secured: two adult males and two adult females from Kupreanof (nos. 9548-9551), and the young bird mentioned above (no. 9552). These are not perceptibly different from others from the interior of Alaska and other parts of North America.

Spinus pinus (Wilson). Pine Siskin.

In view of the abundance of the species on Admiralty and Chichagof islands, as reported by the 1907 Expedition, it seems strange that we found it at so very few points. A few flocks of siskins were seen at Boca de Quadra, and a number on the Chickamin River. At the latter place they were feeding in company with the Sitka crossbill, and in both localities they kept high in the trees, out of shotgun range for the most part. One specimen was secured, an adult male (no. 9547), Chickamin River, June 24. This bird is very dark colored, though not more so than some individuals from other localities.

Plectrophenax nivalis nivalis (Linnaeus). Snow Bunting.

A single bird was seen on the wharf at Douglas Island, opposite Juneau, on the morning of April 9, feeding among the refuse and hopping about through the litter on the dock.

Calcarius lapponicus alascensis Ridgway. Alaska Longspur.

An abundant species on the grassy meadows bordering the Taku River. During our stay at this point, September 4 to 28, longspurs were seen almost daily, usually in flocks of from twenty to thirty individuals, and evidently migrating. They were hard to see in the tall grass in which they were feeding, and still more difficult to secure, for they would sit quietly until nearly trodden upon, when the whole flock would dart away simultaneously.

They were observed at no other point, unless Hasselborg was correct in his belief that a bird seen on the summit of Pin Peak, Coronation Island (altitude 1300 feet), on May 16, belonged to this species.

The fourteen examples of the Alaska longspur collected (nos. 9553-9566), all immatures in first winter plumage, bear out the characters ascribed to the race, being conspicuously paler and more buffy on the upper parts as compared with a series of comparable fall specimens of *lapponicus* from Illinois.

Passerculus sandwichensis sandwichensis (Gmelin).

Aleutian Savannah Sparrow.

Four specimens referable to this race were secured, one from Three-mile Arm, Kuiu Island, May 3 (no. 9571), and three from Egg Harbor, Coronation Island, May 15 (nos. 9567, 9568, 9570), all adult males. As no examples of this subspecies were found among the Savannah sparrows collected at other points, it looks very much as though the line of migration of this form lies along the extreme western edge of the archipelago; and as Kuiu Island lies actually farther north than the breeding ground of this bird on Unalaska Island and the Alaska Peninsula, it may be that instead of following the coast line any farther they strike directly westward across the Gulf of Alaska. This assumption is somewhat borne out by the fact that the 1908 Expedition failed to find the species in the Prince William Sound region (see Grinnell, 1910, p. 399), which must be traversed if the coast line is followed. On Kuiu Island, on May 3, the first

date at which any Savannah sparrows were seen, one specimen of *sandwichensis* and three of *savanna* were secured. On Coronation Island, Savannah sparrows were quite abundant in the grass growing on the sandy beach at the head of Egg Harbor, and of five secured, three are *sandwichensis*.

Passerculus sandwichensis savanna (Wilson).

Savannah Sparrow.

First observed on Kuiu Island, May 3, when three were secured and others seen. It was subsequently met with, evidently migrating, at most of the points visited during May—Calder Bay and Klawak Salt Lake, Prince of Wales Island, and on Coronation, Warren, and Heceta islands. On the Chickamin River, in June, the species was fairly common and evidently breeding, the males singing from the tops of the scrubby willows scattered over the meadows. It was next seen at Thomas Bay, in August, where the birds were abundant in the swampy meadows. At Port Snettisham and on the Taku River they were also abundant, and evidently migrating.

Twenty-three specimens were collected (nos. 9572-9594), twelve summer adults, and one adult and ten immatures in fresh winter plumage. Although I designate this series by the name *savanna*, it is merely as a matter of convenience, for this Alaskan race can hardly be considered the same as the one inhabiting eastern North America, although the two forms have developed a wonderful similarity. I am unable to detect a single constant difference—at any rate certain selected individuals from the eastern and Alaskan series at hand are absolutely indistinguishable. As a rule the Sitkan birds seem to have rather more yellow over the eye than the eastern; other average differences are the somewhat larger size and more slender bill of the former, in both of which respects they approach *alaudinus*. It is probably a rather local race, inhabiting the Pacific Coast region from the Sitkan district southward for an undetermined distance, and separated from the range of the eastern *P. s. savanna* by the broad stretch of country occupied by *alaudinus*.

Zonotrichia leucophrys gambeli (Nuttall).

Intermediate Sparrow.

First seen at Thomas Bay, on August 22, when a flock of six or eight was observed in an alder thicket. At Port Snettisham, August 24 to September 1, intermediate sparrows were fairly common on the brushy hillsides, but were shy and difficult to approach. Only immature birds were seen, that is, those with the brown head markings. On the Taku River, during September, they were fairly common, but irregularly so, the numbers seen varying greatly on different days. On September 18 the first adults—with white head stripes—were observed.

The principal migration route of this bird does not seem to include the islands of southeastern Alaska, since the 1907 expedition did not find it on Admiralty Island in the spring, while I did not note it at an island locality at any time.

Five specimens were secured, three from Port Snettisham (nos. 9626-9628) and two from the Taku River (nos. 9629-9630), all immature males in first winter plumage.

Zonotrichia coronata (Pallas). Golden-crowned Sparrow.

Two specimens secured at Calder Bay, Prince of Wales Island, on May 11, were the only ones noted in the spring at any time. These two are adult male and female, and in perfect nuptial plumage (nos. 9623, 9624). The species was met with next at Port Snettisham where a female in first winter plumage was shot on August 29 (no. 9625). It was quite probable that they were fairly common at this point, as Zonotrichias were very numerous in the brush; and although all that were seen near enough to identify were *Z. l. gambeli,* still, in the immature plumage, the two species are so much alike as to be easily confused.

On the Taku River during September golden-crowned sparrows were seen on several occasions, but were never at all common.

Spizella monticola ochracea Brewster. Western Tree Sparrow.

Hasselborg reported tree sparrows as abundant along the Taku river on October 20, and again at Game Cove, Admiralty Island, on November 8. No specimens were secured, but as he is familiar with the species, I have no hesitation in accepting his statement.

Junco hyemalis hyemalis (Linnaeus). Slate-colored Junco.

On September 4, on the Taku River, one specimen was secured, which was in company with another, apparently of the same species. On several subsequent occasions during September I saw what I supposed were examples of slate-colored juncos, in flocks of *oreganus*, but failed to get any. The single specimen obtained (no. 9620) is an immature male, in first winter plumage, and is typical of the species, but with the gray of the back somewhat overcast with brownish, as is usually the case with young birds. This bird, in common with the small series at hand from Prince William Sound, is remarkable in that the outer tail feather only, is pure white. The next has about the terminal third of the outer vane black, and the third has no white on it at all. Specimens of *hyemalis* at hand from the interior of Alaska and from the eastern United States all have more or less white on the three outer rectrices.

A junco taken on the Taku River on September 12 (no. 9619) is, I believe, a hybrid between *hyemalis* and *oreganus*. It is an adult male, in its second year at least, as was apparent from the condition of the skull, and is in fresh, winter plumage. In general it may be said to be like *oreganus* above, and like *hyemalis* below. The brown of the dorsum is sharply defined against the head, but is of a darker shade than is ever the case in *oreganus*, being between mummy and prout brown, while the feathers of the back are only brown-tipped, being black basally. The outline of the black throat is convex against the white of the lower surface, but the sides and flanks are slaty, with but a slight tinge of vinaceous.

Junco oreganus oreganus (Townsend). Oregon Junco.

Though we found the Oregon junco quite generally distributed over the region traversed, it was not common anywhere until late in the summer, when the broods of young began to appear about the woods. The first arrival was noted on Kupreanof Island, on April 19, a single bird, and on the following day a small flock was seen at the same place. A few scattered individuals were seen on Kuiu, Prince of Wales, Warren, Heeeta, and Dall islands. At Portage Cove, Revillagigedo Island, juncos were fairly common and evidently breeding in the brush bordering the meadows. At Etolin Island, July 5 to 12, the first broods of young were seen flying about, and at Bradfield Canal, Zarembo Island, and Mitkof Island they became comparatively abundant. At Thomas Bay, August 13 to 23, juncos were common, feeding in the open, grassy meadows, or on the ground in the shelter of the alder thickets. Old and young were in the midst of the molt at this time, and were all very ragged in appearance. At Port Snettisham a few juncos were seen, but they were not abundant. On the Taku River in September, small flocks were seen daily. Young birds taken during the first week in September had nearly finished the post-juvenal molt, having but a few spotted feathers remaining, while an adult female shot on September 22 (no. 9622) has also practically completed the change. This adult differs from young females in first winter plumage in having the black of the head sharply defined against the brown back, while in the latter there is no line of demarcation, the brown extending over most of the head.

Twenty-six specimens were secured from the following localities: Kuiu Island, one (no. 9595), Warren Island, one (no. 9596), Heceta Island, one (9597), Rocky Bay, Dall Island, two (nos. 9598, 9599), Portage Cove, Revillagigedo Island, one (no. 9600), Etolin Island, one (no. 9601), Bradfield Canal, one adult (no. 9605) and three juvenals (nos. 9602-9604), Zarembo Island two juvenals (nos. 9606, 9607), Mitkof Island, one juvenal (no. 9608), Thomas Bay, two adults (nos. 9609, 9610), Port Snettisham, one adult (no. 9611), Taku River, one adult (no. 9622) and eight immatures (nos. 9612-9621).

Although *Junco oreganus* is generally considered to be a race of *J. hyemalis,* and the trinomial used to designate it, I have seen no conclusive evidence in support of this view, while there is much to be said against it. *Hyemalis* ranges, without perceptible change, from the Atlantic coast to the interior of Alaska, to within a comparatively short distance of the Pacific coast, where it is abruptly replaced by *oreganus.* There is no blending of characters where the ranges of the two species meet —the criterion usually accepted as the test of a subspecies. Alaskan examples of *hyemalis* are indistinguishable from those taken in eastern North America; neither can the races or species of juncos occupying intermediate regions farther south be said to illustrate intergradation. Occasionally individuals are met with combining the characters of *hyemalis* and *oreganus* (such as the specimen no. 9619 described in this paper under *J. hyemalis*); but I am inclined to accept Ridgway's view (1901, p. 276), and to consider such birds as hybrids.

Melospiza melodia rufina (Bonaparte). Sooty Song Sparrow.

When I arrived in Alaska, early in April, there were no song sparrows to be seen anywhere, and it seems evident that *rufina* does not remain through the winter in the northern part, at least, of its breeding range. It was first seen at Three-mile Arm, Kuiu Island, on April 30, when two specimens were secured, and from then on it was observed, though usually in small numbers, at almost every point visited. By the third week in May they had begun to pair off; and the female of a pair secured on Duke Island, June 8, was evidently incubating, as were others secured on the Chickamin River, June 17 to 28. At Portage Cove, Revillagigedo Island, a nest containing four eggs was found on June 28, built in tall meadow grass about a foot above the ground. The first young were seen at Etolin Island, on July 6, and specimens in juvenal plumage were secured at various points up to as late a date as September 4.

One taken at Port Snettisham on August 28 (no. 9698) has almost completely acquired the first winter plumage, and others obtained on the Taku River during September are in this plumage throughout. An adult female shot at Thomas Bay on

August 21 (no. 9697) is in the midst of the post-nuptial molt, and is but scantily covered with feathers. At all the island localities visited the sooty song sparrow was distinctly a bird of the beaches, and was observed nowhere else; but at several of the mainland points, Chickamin River, Thomas Bay, and Taku River, it was common in the grassy meadows bordering the streams.

Twenty-five specimens were secured, from the following localities: Kuiu Island, three (nos. 9677, 9678, 9684); Klawak, Prince of Wales Island, one (no. 9687); Warren Island, two (nos. 9685, 9686); Duke Island, two (nos. 9688, 9689); Boca de Quadra, one (no. 9693); Chickamin River, three (nos. 9690-9692); Etolin Island, one (no. 9694); Thomas Bay, three (nos. 9695-9697); Port Snettisham, one (no. 9698); and Taku River, eight (nos. 9699-9706).

Melospiza melodia caurina Ridgway. Yakutat Song Sparrow.

The first song sparrows to appear in the region in the spring were large sized, gray colored individuals, conspicuously different, even in life, from the smaller, brownish birds which arrived soon after. The earliest arrival was seen on Kupreanof Island, on April 18; the next at Three-mile Arm, Kuiu Island, April 26, when three were secured. These gray colored birds were seen from time to time up to about the middle of May, when they disappeared. Specimens were collected as follows: Three-mile Arm, Kuiu Island, five (nos. 9673, 9676, 9679-9681); Port Protection, Prince of Wales Island, one (no. 9682); Calder Bay, Prince of Wales Island, one (no. 9683). Through the courtesy of the authorities of the National Museum I have been able to compare these birds with a series of specimens of *caurina* from Yakutat Bay, and, allowing for the slight differences due to the different seasons at which the two series were collected (the latter were taken in June), find them indistinguishable in color and proportions.

In studying the song sparrows of the present collection I took occasion to go over the specimens secured by the 1907 Expedition; and, in the light of much additional material, together with a better knowledge of local conditions, have arrived at

conclusions regarding these birds differing from those expressed by Grinnell in his report upon the collection of that year (1909, pp. 229-231). On the supposition that song sparrows were resident wherever found in this region, all the specimens collected were included by Grinnell under the subspecies *rufina,* with comment upon the variability of the form. The supposedly aberrant specimens, however, are all very much alike, were all secured upon dates on which they might well be migrating, and are all, I believe, to be referred to *Melospiza m. caurina.* The individuals referred to are as follows: one specimen from Windfall Harbor, Admiralty Island, April 21 (no. 528); two from Peril Strait, Baranof Island, August 24 (no. 507), and August 25 (no. 508); three from Helm Bay, September 14 (no. 517), and September 15 (nos. 518, 519); and one from Thomas Bay, September 3 (no. 515). Of two breeding birds from Glacier Bay, one (no. 512) is a good example of *rufina,* while the other (no. 514), both in coloration and in slenderness of bill, is decidedly like *caurina,* as already stated by Grinnell (*l. c.*). Glacier Bay being about at the dividing line between the breeding ranges of the two forms, specimens from this point might be expected to manifest a mingling of the characters of the two, in other words to show intergradation between them, but such cannot be said to be the case with these two individuals. One is an extreme example of *rufina,* the other an average specimen of *caurina.*

Included in the series loaned me by the National Museum is one taken at Howkan, Alaska (on Long Island, near the southern extremity of Prince of Wales), on January 6, 1897 (no. 154414). This would indicate that *caurina* spends the winter as far north as the southern part of the Alexander Archipelago, though, judging from my experience, it does not do so on the more northern islands of the group.

Melospiza lincolni gracilis (Kittlitz). Forbush Sparrow.

First met with at San Alberto Bay, Prince of Wales Island, on May 25, when a single bird was secured; while a day or two later several were observed in the meadows about Klawak Salt Lake. The species was not encountered again until we reached

the Chickamin River, where it was quite common, and evidently breeding. No nests were found, but a female shot at this point had laid part of its set; the males were observed continually singing from the tops of small trees.

It is of special interest to note that *here* the Forbush and song sparrows were about equally abundant, and breeding in precisely the same places—the broad grassy meadows bordering the stream—furnishing an instance of two species of a genus occupying exactly the same area during the *breeding* season. This is of interest as an apparent exception to what seems to be a very general rule to the contrary among vertebrates, and one that holds in regard to these species in other parts of their range, as in most of our record stations in southeastern Alaska. While elsewhere in this general region the song sparrows are found on or near the beach, the Forbush sparrow occurs in the grassy meadows or swamps, usually some distance from tidewater, and never along the shore.

The song sparrow (*Melospiza melodia*) with its various subspecies, and the Lincoln sparrow with its two races, *Melospiza lincolni lincolni* and *M. l. gracilis*, are found over nearly all parts of North America, the former in the Sonoran Zone over most of its range, the latter in the Canadian and Hudsonian. The mild climate of the northwestern Pacific Coast region has enabled the song sparrow to extend farther north here than elsewhere, and the ranges of the two species have thus overlapped. Even, here, however, local conditions keep them slightly separated for the most part, and of the places visited by us it was only in this one river valley that environmental conditions seemed to be favorable to both species. The song sparrow is apparently the most recent arrival, as in other seemingly very similar places it was either very rare or entirely absent, while the Forbush sparrow was found in all such meadows.

At Portage Cove, Revillagigedo Island, it was quite common in the boggy meadows. A nest was found built on the ground, and well concealed under a bunch of drooping dead grass, which gave it almost the appearance of a domed structure. In the morning of July 1 it contained five young birds, which had all left before night.

On Mitkof Island several broods of young birds were seen along one of the streams. One secured here on August 8 (♂ juv. no. 9640) is just beginning to molt the juvenal plumage, a few pin feathers appearing on the throat, breast and crown. At Thomas Bay (August 13 to 23) the species was fairly abundant in the meadows, all that were secured being immatures that had assumed the first winter plumage, few showing even a trace of juvenal feathers. They were also exceedingly abundant at Port Snettisham, feeding in the tall grass at the edge of a dense willow swamp. Along the Taku River they were fairly common, usually at the edge of the meadows, where bordering thickets afforded an abundance of shelter.

Twenty-four specimens were secured, as follows: San Alberto Bay, Prince of Wales Island, one (no. 9631), Klawak Salt Lake, one (no. 9632), Chickamin River, four (nos. 9633-9636), Portage Cove, Revillagigedo Island, one (no. 9637), Mitkof Island, three juvenals (nos. 9638-9640), Thomas Bay, four immatures (nos. 9641-9644), Port Snettisham, five immatures (nos. 9645-9649), Taku River, five immatures (nos. 9650-9654).

Passerella iliaca insularis Ridgway. Kadiak Fox Sparrow.

A single fox sparrow taken at Three-mile Arm, Kuiu Island, on April 30, is apparently to be referred to this form. It is a pale colored, large-billed bird, widely different from the breeding bird of the region (*P. i. townsendi*). Neither is it to be referred to the breeding bird of the Prince William Sound Region (*P. i. sinuosa*) from which it differs in browner color and much larger bill.

This bird (♂ ad. no. 9655) was caught in a mouse trap set on a little island in the bay. It was the only fox sparrow that was seen on any of the islands south of Frederick Sound, no form of *Passerella* being found breeding at any point.

Passerella iliaca townsendi (Audubon).

Townsend Fox Sparrow.

As no fox sparrows were observed at any of the numerous places visited between Frederick Sound and Dixon Entrance, this

bird can hardly be considered as a component part of the fauna of the region, as has been supposed. I could hardly have overlooked the species entirely if it had been present, for I was on the lookout for it constantly, but with the exception of the single example of *P. i. insularis* noted above, no fox sparrow was observed at any island locality visited; nor at any mainland point until we reached Port Snettisham. This is the more remarkable in that while the species is common on the more northern islands of the Alexander Archipelago (Admiralty, Chichagof, and Baranof), it is also known to occur abundantly on the Queen Charlotte Islands to the southward (Osgood, 1901, p. 48).

At Port Snettisham, August 24 to September 2, fox sparrows were abundant. The hillsides at this point were covered in places with dense masses of low underbrush, these thickets being composed almost entirely of a single species of plant (*Cladothamnus pyrolaeflorus*). This provided the fox sparrows with an abundance of shelter and here most of them were found, though a few were also observed in willow thickets and in the alders along the beach. These brush-covered slopes bore a strong general resemblance to the chinquapin-covered hillsides of the higher mountains of southern California—the favorite haunt of *Passerella i. stephensi*—a similarity further borne out by the presence of these sparrows.

On the Taku River, during September, fox sparrows were irregularly abundant and evidently migrating, the last being noted on September 19.

Seventeen specimens were collected. One (no. 9664, ♂ juv. Port Snettisham, August 29) is in the juvenal plumage purely; three others from Port Snettisham (nos. 9657, 9658, 9661) are molting from the juvenal to the first winter plumage; the remainder of the series, nine from Port Snettisham (nos. 9656, 9659, 9660, 9662, 9663, 9665-9668) and four from the Taku River (nos. 9669-9672), are all in first winter plumage. No adults were secured. They are extremely dark colored, as compared with spring and summer specimens of *townsendi*, but this is probably due to the fresh unworn state of the plumage.

Piranga ludoviciana (Wilson). Western Tanager.

A single bird taken on the Chickamin River on June 21, (no. 9354) is, I believe, the first of the species to be reported from any part of Alaska. This specimen is a male adult, in rather dull plumage, with but little red on the head. It was heard singing in the distance and at first mistaken for a robin and nearly passed by as such. Search finally revealed the singer in the top of an alder, at the edge of the woods, where it was secured. From the bird's appearance and actions I feel quite sure that it had a mate on a nest somewhere in the vicinity. It is the only one of the species that was seen.

Hirundo erythrogaster palmeri Grinnell.
Western Barn Swallow.

First seen at Marten Arm, Boca de Quadra, June 9 to 14. Here the barn swallows were fairly common, hovering over the grassy meadows in company with the swifts and tree swallows. On the Chickamin River they were seen daily, though not in any numbers; all observed being in pairs.

A few pairs were seen at Portage Cove, Revillagigedo Island, the only island locality where barn swallows were noted. At Thomas Bay the species was far more abundant than at any other point, large gatherings of adults and young together circling about over the meadows. At this time, August 13 to 23, many of the young were still attended by their parents. At Port Snettisham, August 24 to 31, small flocks were occasionally seen passing high overhead, evidently migrating southward.

Six specimens were collected: adult male, Boca de Quadra (no. 9373), adult female, Revillagigedo Island (no. 9374), and two adults and two juvenals from Thomas Bay (nos. 9375-9378).

These specimens, as well as others in the Museum collection from the Sitkan district, bear out the ascribed characteristics of *palmeri*, at least as regards the dark coloration of the ventral surface, broad, chestnut forehead patch, and deeply forked tail—as compared with specimens from the eastern United States,—but I am unable to appreciate any difference in the wing length.

Iridoprocne bicolor (Vieillot). Tree Swallow.

First noted at San Alberto Bay, Prince of Wales Island, on May 24, when several migrating swallows, apparently of this species, were seen. During the next few days numerous small flocks were observed, usually flying so high overhead that they would not have been noticed were it not for their continual twittering. At Boca de Quadra there were a few pairs, but the species was not common. On the Chickamin River they were noted daily, and several were seen entering holes in dead trees. At Portage Cove, Revillagigedo Island, there were also a few pairs. Only one or two single birds were seen at Bradfield Canal, but at Zarembo Island flocks of juvenals were observed hovering about over the mud flats, but a few inches from the ground. On Mitkof Island a single bird was seen flying south on August 12. At Thomas Bay, August 13 to 23, the species was abundant over the grassy meadows, in company with the barn swallows. This is the last point at which it was noted.

Five specimens were collected: two adult males, Chickamin River (nos. 9368, 9369), adult male, Portage Cove, Revillagigedo Island (no. 9370), juvenal male, Zarembo Island (no. 9371), and juvenal male, Thomas Bay (no. 9372). There are no apparent differences between these and California specimens.

Tachycineta thalassina lepida Mearns.

Northern Violet-green Swallow.

On the Chickamin River, June 17 to 28, I several times saw violet-green swallows, the lateral white patches at the base of the tail serving to distinguish them from the tree swallows with which they were associated. Hasselborg saw some "white-rumped" swallows twenty-five miles up the river. At Thomas Bay several were seen in the large flocks of barn and tree swallows, and a juvenal male secured on August 22 (no. 9379).

Riparia riparia (Linnaeus). Bank Swallow.

At Thomas Bay, August 15, a single bank swallow was seen repeatedly. This was the only occasion on which the species was observed, but the peculiar flight and coloration both served to

distinguish this bird from the other species of swallows it was associated with at the time, and I have no doubt as to the correctness of the identification.

Bombycilla cedrorum Vieillot. Cedar Waxwing.

A single bird, an adult male, taken June 22 on the Chickamin River (no. 9355). This bird was feeding by itself in a spruce tree, when my attention was drawn to it by its occasional utterance of the low hissing sound peculiar to the species. This was the only cedar bird seen during the summer; it had no appearance of being a breeding bird, and was doubtless a straggler from the interior, strayed down the river. It is, I believe, the first individual of the species to be recorded from Alaska.

Lanius borealis invictus Grinnell. Alaska Shrike.

Hasselborg saw a shrike on the Taku River on October 20, and another at Game Cove, Admiralty Island, on November 8. He was very close to the latter, but had no means of securing it, and remarks that it is the only one of the species that he has seen on any of the islands.

Vermivora celata celata (Say). Orange-crowned Warbler.

Met with only at Port Snettisham. It was seen high up on the mountain sides only, beyond the timber and almost always in thickets of *Cladothamnus pyrolaeflorus*, in company with the Townsend and intermediate sparrows. *Lutescens*, which was also common at Port Snettisham, was never seen in this association, but kept lower down, usually in the alders along the beach, where *celata* was never observed. Possibly ten or twelve individuals were seen in all. They were restless and shy, and evidently migrating, flitting from bush to bush, or occasionally rising high in the air manifestly for a long flight, and disappearing in a southerly direction.

Four specimens were secured, three in complete first winter plumage (nos. 9493-9495), and one which has nearly finished the molt from the juvenal to the first winter plumage (no. 9496). An immature male (no. 9495) has the concealed orange crown fairly well indicated. In the other three (all immature females)

there is no indication of such a mark. All four are typical, even extreme, examples of *celata,* with white orbital ring and gray head, and with the underparts streaked with grayish. They can be matched with fall specimens from southern California, as well as with some from other parts of North America.

Vermivora celata lutescens (Ridgway). Lutescent Warbler.

The first of the species, a single bird, was seen on Warren Island May 19, and during the rest of our stay at this place, until May 23, they were occasionally observed flitting through the alders along the beach. The only other place along the western edge of the archipelago where the species was seen was at Rocky Bay, Dall Island, where one was secured, and several others seen on May 31. On the Chickamin River they were rare; At Portage Cove, Revillagigedo Island, they were fairly common, and apparently breeding in the scrubby thickets. The males were in full song at this time. At Bradfield Canal, July 18 to 26, they were seen daily, the first juvenals being observed at this point. But a single bird was seen on Zarembo Island.

At Mitkof Island, August 1 to 13, they were observed in numbers, evidently migrating, usually in the fringe of alder along the beach. At Thomas Bay they were quite common, as also at Port Snettisham. A few were seen on the Taku River up to September 7; no more were observed until September 19, when a single bird was met with, the last record for the season.

Eleven specimens were collected, as follows: Warren Island, one (no. 9497); Rocky Bay, Dall Island, one (no. 9498); Chickamin River, one (no. 9499); Portage Cove, Revillagigedo Island, one (no. 9500); Bradfield Canal, two juvenals (nos. 9501, 9502); Bradfield Canal, two juvenals (nos. 9503, 9504); Thomas Bay, one immature (no. 9505); Port Snettisham, one immature (no. 9506); Taku River, one immature (no. 9507).

Dendroica aestiva rubiginosa (Pallas). Alaska Yellow Warbler.

Apparently of quite rare occurrence in this region, for it was seen in very few places, and in limited numbers. A single bird, an adult male, seen, but not secured, at Rocky Bay, Dall Island, on May 30, was the first observed, and also the only individual

seen on any of the islands. At Boca de Quadra, June 9 to 14, one was heard singing on several occasions. On the Chickamin River, June 17 to 28, probably eight or ten were seen or heard singing, in clumps of willow on the meadows, but they appeared to be migrating, and specimens secured at this time were evidently not breeding. At Thomas Bay, August 13 to 23 they were migrating southward, a few individuals being seen in mixed flocks composed of Townsend and pileolated warblers, kinglets and chickadees. On the Taku River they were seen from time to time up to the last day of our stay, September 28. All that were observed were exceedingly wild and unapproachable, and it was with the greatest difficulty that any were obtained. Eight specimens were secured, three adult males and two adult females from the Chickamin River (nos. 9508-9512), two immatures, male and female, from Thomas Bay (nos. 9513, 9514), and an immature female from the Taku River (no. 9515).

Dendroica coronata hooveri McGregor.

Alaska Myrtle Warbler.

Met with only on the Taku River, where, however, the species was not at all uncommon. First noted on September 7, and seen daily thereafter up to the end of my stay, evidently migrating, and usually in loose flocks of from six to ten individuals.

Nine specimens were collected, all immatures in first winter plumage. At this stage *hooveri* is apparently but very slightly distinguished from true *coronata*. Compared with a small series of autumnal immatures from Illinois the Alaskan birds average slightly larger, while the coloration of the upper parts is somewhat darker. The specimens secured measure as follows:

No.	Sex	Date	Wing	Tail	Tarsus	Bill from Nostril
9524	♂	Sept. 7	74.0	58.0	17.5	7.0
9525	♂	Sept. 7	73.0	54.0	18.0	7.0
9257	♂	Sept. 10	76.0	58.0	18.0	7.0
9828	♂	Sept. 10	77.5	60.8	16.5	7.2
9529	♂	Sept. 12	74.0	56.0	17.5	7.2
9531	♂	Sept. 14	73.0	58.2	17.5	....
9526	♀	Sept. 9	69.0	54.0	17.0	7.2
9530	♀	Sept. 13	69.0	55.0	17.2	7.0
9532	♀	Sept. 24	70.5	52.8	16.0	....

Dendroica striata (Forster). Black-poll Warbler.

A single specimen, an immature female in complete first winter plumage, secured on the Taku River, September 4 (no. 9533). It was in a mixed flock of warblers, kinglets, and nuthatches, evidently migrating. Probably but a straggler from the interior, as it was not previously known to occur in the coast region, its southward line of migration lying east of the mountains entirely.

Dendroica townsendi (Townsend). Townsend Warbler.

Nowhere very common in this region, though observed at many scattered localities. The first was seen at Calder Bay, Prince of Wales Island, on May 12, an adult male. Next observed at Warren Island, where one was secured on May 21 and several others seen during the next few days. The species was then lost sight of until Boca de Quadra was reached. Here I secured the male bird of a pair which was possibly preparing to breed in the vicinity, though they were the only ones seen at this point. This individual, though a breeding bird, is not in perfect, mature, plumage, the black of the throat being much obscured by the yellow tips of the feathers. No more were observed until we arrived at Mitkof Island, in August. By this time the southward migration was under way, and an occasional Townsend warbler could be seen in the flocks of small migrants flitting along the shrubbery at the edge of the woods. At Thomas Bay also they were seen almost daily, usually in the alders, while on the Taku River occasional individuals were seen up to September 14.

Eight specimens were secured: adult male, Warren Island (no. 9516); adult male, Boca de Quadra (no. 9517); adult female, Mitkof Island (no. 9518); two immatures, Thomas Bay (nos. 9519, 9520); three immatures, Taku River (nos. 9521-9523).

The female from Mitkof Island (no. 9518, August 11) is in the midst of the post nuptial molt. The immatures are all in complete first winter plumage.

Oporornis tolmiei (Townsend). Tolmie Warbler.

Although this species has not been previously reported from Alaska, we found it at nearly all the mainland points visited, as far north as Port Snettisham. At Boca de Quadra, where it was first seen, my attention was drawn to the birds by the singing of the males, usually in the willow thickets bordering the meadows. Several were seen or heard, and an adult male and female secured. At this time (June 11 to 14) they were apparently preparing to breed. On the Chickamin River, later in June, the species was fairly common in similar situations, and was undoubtedly breeding. The males were heard singing continually, but they were exceedingly shy, and hard to catch sight of, as they clung to the dense thickets and tangled shrubbery. At Bradfield Canal, the middle of July, several were seen, while at Port Snettisham, August 25 to September 1, four were secured and several others noted. At this latter place all that were seen were in thick vegetation about the edges of a dense willow swamp, and the birds were very quiet and unobtrusive. They were probably fairly numerous at this point, though comparatively few were secured. The species was not observed at any island locality.

Nine specimens were secured: two adults from Boca de Quadra (nos. 9463, 9464), two adults from the Chickamin River (nos. 9465, 9466), an adult female from Bradfield Canal (no. 9467), four immatures from Port Snettisham (nos. 9468-9471).

I am unable to appreciate any points of difference whatever between these specimens and others from more southern localities, including a series of breeding birds from Nevada.

Geothlypis trichas occidentalis Brewster.

Western Yellowthroat.

One of the most interesting results of the season's work was the discovery of the western yellowthroat at two points on the coast of southeastern Alaska, at one of which it was most assuredly breeding. On the Chickamin River it was fairly common in the meadows of tall grass. All that were seen were in pairs, while of the two adult females secured, one shot on June 20 (no.

9473) had laid part of its set, and contained a partly formed egg that would have been laid in a day or two, and the other, shot on June 23 (no. 9475) was evidently incubating. The males were in full song, and it was the familiar "witch-a-ree" note that first drew my attention to the presence of these birds, so unexpected in this region. They were shy and retiring, the grass they were in was waist high and higher, and altogether it was no easy matter to see them in the first place, or to find a bird after it was shot. The species was subsequently met with only on the Taku River, where a few were seen on September 4, and again on September 9, none being observed after the latter date.

Ten specimens were secured, five adult males and two adult females from the Chickamin River (nos. 9472-9478), and two immature males and an immature female from the Taku River (nos. 9479-9481), the latter in complete first winter plumage. They are, as far as I can see, quite indistinguishable from a series of breeding birds from Humboldt County, Nevada, which may be considered as typical of *occidentalis;* but even aside from the appearance of the birds, the manner of their occurrence alone would incline one to place their affinities with the form of the interior, rather than with *arizela* of the more southern coast region. It will be noticed that the two places where yellowthroats were found were along the margins of large rivers which pierce the mountains paralleling the coast, and form direct and favorable passes from the interior; it is my belief that the birds reached the coast by following down these streams. If the form found in southern British Columbia (*arizela*) reached Alaska at all it would be by way of the coast, where it might be expected to occur at all suitable points. Besides the places where we found yellowthroats, we worked at several mainland points apparently admirably adapted to their needs, Boca de Quadra, Thomas Bay, and Port Snettisham, but in these localities we failed to find them. At none of these points, however, is there any such highway to the country beyond the mountains, the streams either arising from the glaciers, or if they go back into the mountains for any distance, passing through rough, precipitous country, utterly unsuited to the birds' requirements. Hasselborg ascended the Chickamin River some twenty-five miles, finding meadow

land all along the stream, and he shot a yellowthroat at the farthest point he reached.

We find here an extraordinary instance of a bird race from the arid interior which has invaded a region of extreme humidity through narrow passes, and which has undergone no modification in its coloration in the direction of melanism.

Wilsonia pusilla pileolata (Pallas). Pileolated Warbler.

By no means as generally distributed as I had expected to find it, and not seen on any of the more western islands of the archipelago. First noted at Portage Cove, Revillagigedo Island, June 28 to July 4, where several were observed in thickets bordering the meadows. The males were in full song at this time, and making themselves so conspicuous thereby that I could hardly have overlooked the species had it been present at any of the points previously visited. It was next encountered at Mitkof Island, evidently migrating, and fairly common in the alders along the beach. At Thomas Bay and Port Snettisham also it was quite abundant at times, and on the Taku River it was frequently observed during the early part of September. By the middle of the month the birds were practically all gone, though a belated straggler was seen as late as September 21.

Eleven specimens were secured: two adult males from Revillagigedo Island (nos. 9482, 9483), a juvenal male from Mitkof Island (no. 9484), and eight immatures from Mitkof Island, Thomas Bay, and Port Snettisham (nos. 9485-9492). No. 9484 (male juvenal August 4) is molting from juvenal to first winter plumage, with the former predominating. It has no trace of the black cap, the pileum being concolor with the back, though the forehead is decidedly yellowish. The greater wing coverts are distinctly tipped with whitish, forming a conspicuous bar across the wing. The immature males in first winter plumage have the black cap quite as extensive and distinct as the adults though the black feathers are more or less tipped with yellowish, but in the immature females such marking is either entirely absent or indicated by but one or two black feathers.

Anthus rubescens (Tunstall). American Pipit.

Observed at comparatively few points. At Kupreanof Island on April 21, a small flock was seen on a sand bar near the camp. At Calder Bay, Prince of Wales Island, May 11 and 12, several small companies were flushed from the grass on the beach, while at Egg Harbor, Coronation Island, scattered individuals were observed, also along the beach. The species was then lost sight of until we reached Marten Arm, Boca de Quadra, where, on June 9, large flocks were encountered on the meadows, evidently still migrating. It was next seen on the Taku River, September 4 to 28, single birds being occasionally met with along the banks of the stream.

Two specimens were secured, an adult male from Egg Harbor, Coronation Island (no. 9461), and an immature male (in complete first winter plumage) from the Taku River (no. 9462). There is singularly little difference in the color and markings of the two birds. High plumaged old males from California have the lower surface of the body distinctly cinnamomeous and sometimes almost entirely devoid of black streaking, while winter birds are entirely devoid of this cinnamon tinge. This Alaskan immature is quite as cinnamomeous below as is the adult, and there is practically no difference between the two in the character and extent of the black streakings.

Cinclus mexicanus unicolor Bonaparte. American Dipper.

A single bird seen by Hasselborg on May 11 on a stream emptying into Calder Bay, Prince of Wales Island. This is the only occasion on which the species was met with during the entire summer.

Nannus hiemalis pacificus (Baird). Western Winter Wren.

Quite generally distributed over the region but common nowhere until the young birds began to appear, toward the end of July. The first was seen at Three-mile Arm, Kuiu Island, April 29. On Prince of Wales Island, at Port Protection and Calder Bay, one or two were heard singing in the woods. Several were observed on Coronation Island. On Warren Island one was

singing about the tent continually, probably with his mate on a nest somewhere near by. At Boca de Quadra, Chickamin River, Portage Cove and Etolin Island they were seen or else heard singing in the woods occasionally, but were anything but abundant. At Bradfield Canal, July 18 to 26, the first juvenals were seen flying about. A few were observed at Zarembo Island, and on Mitkof Island they were quite abundant in the masses of drift along the beach. On the Taku River many were seen during the first two weeks in September, but they nearly all disappeared by the middle of the month. The last was observed on September 24.

Nine specimens were secured: two adults from Kuiu Island (no. 9407) and Shakan, Prince of Wales Island (no. 9408), and seven in juvenal plumage: two from Bradfield Canal (nos. 9409-9410), one from Zarembo Island (no. 9411), and four from Mitkof Island (nos. 9412-9415).

Certhia familiaris occidentalis Ridgway. Tawny Creeper.

Seen at but very few points. On Kupreanof Island, the first arrival, a single bird was observed on April 20, and on April 23 two were seen and one of them secured. The species was not met with again until we reached Zarembo Island at the end of July, where several were seen within a few days, though curiously enough, none was noted on neighboring islands visited immediately before and after. A single bird, seen, but not secured, at Port Snettisham on August 26 completes the list of records for the summer.

Five specimens were secured: an adult male from Kupreanof Island (no. 9416) and an adult (no. 9418) and three juvenals (nos. 9417, 9419, 9420) from Zarembo Island. The single adult from Kupreanof Island, in fresh, unworn plumage, exhibits the characteristics of *occidentalis* to a marked degree, the upper parts generally being suffused with tawny cinnamon to such an extent that there are no pure white markings anywhere, either on back or wings. The only other adult secured (female, Zarembo Island, July 30), is in exceedingly shabby, abraded plumage, but is nevertheless evidently to be referred to this form. The three young birds, all in full juvenal plumage, are also unquestionably *occidentalis*, being markedly cinnamomeous

above, as compared with the paler backed juvenals of *montana* from the Prince William Sound region.

Sitta canadensis Linnaeus. Red-breasted Nuthatch.

A single bird, seen, but not secured, by Hasselborg, at Egg Harbor, Coronation Island, on May 17, was the only one of the species observed on any of the islands. It was not again met with until September, on the Taku River, where it was fairly common, though irregularly so, many individuals being seen in the flocks of migrating warblers and kinglets. Six specimens were shot at this point, two male and three female immatures in complete first winter plumage (nos. 9381-9385), and one adult female, also in perfect winter plumage (no. 9380). The adult differs from the young females in having the top and sides of the head dull black, in marked contrast to the slate-blue dorsum. In the immatures the head is concolor with the back. The two immature males have the pileum glossy black, apparently not differing from the adult males in any respect.

Penthestes rufescens rufescens (Townsend).

Chestnut-backed Chickadee.

Quite generally distributed, and fairly common, as land birds go in this region. On Kupreanof Island, upon our arrival early in April, the species was not common, but was becoming more so daily. On Kuiu it was decidedly scarce. On Prince of Wales Island some were seen at every point visited, Port Protection, Calder Bay, San Alberto Bay, and Klawak, but they were nowhere at all common. On Coronation Island (May 14 to 18) a number were seen, some in small flocks, but many in pairs; the latter strongly resented our appearance, and probably had nests somewhere near by. On Warren Island also they were quite numerous, and all in pairs. A few were observed at all the points touched on Dall Island, and on Duke Island. On the Chickamin River and Portage Cove, Revillagigedo Island, they were not common. The first young were observed flying about on Etolin Island, July 11, several broods being observed. They were scarce at Bradfield Canal and on Zarembo Island, but on Mitkof Island, Thomas Bay and Port Snettisham, many

were seen, almost always in small flocks together with migrating kinglets and warblers.

It is rather remarkable that during our whole stay on the Taku River, September 4 to 28, not a single chickadee of any kind was observed, though I had hoped from the many inland forms which appeared from time to time, that I might find *P. a. turneri* at this point, as well as *P. rufescens*.

Twenty-one specimens of the chestnut-backed chickadee were preserved, from the following localities: Kupreanof Island, eight (nos. 9386-9393), Kuiu Island, two (nos. 9394, 9395), Prince of Wales Island, three (nos, 9396, 9397, 9400), Coronation Island, two (nos. 9398, 9399), all adults; and the following juvenals: Etolin Island two (nos. 9401, 9402), Mitkof Island, two (nos. 9403-9404), and Thomas Bay, two (nos. 9405, 9406).

Juvenals from Mitkof Island and Thomas Bay, shot on August 11 and 16, are just beginning to molt into the first winter plumage.

Regulus satrapa olivaceus Baird.

Western Golden-crowned Kinglet.

One of the few species of land birds that was fairly common, and quite generally distributed over the region. The first, a single bird, was seen April 12 on Kupreanof Island where occasional small flocks were met with thereafter. A few were observed on Kuiu Island, and also at the various points visited on the north and west coasts of Prince of Wales and Dall islands. On Coronation and Warren islands, in May, it was quite common and still in flocks. Several pairs were seen at Boca de Quadra and the Chickamin River, on the mainland. The first juvenals were observed on Etolin Island, July 6 to 12, several small flocks being encountered, probably composed each of a single family. The species was subsequently met with at Bradfield Canal, Zarembo and Mitkof islands, Thomas Bay, Port Snettisham, and the Taku River, at all these latter points being gathered in small flocks, traveling southward, frequently in company with migrating warblers.

Fifteen specimens were collected: Kupreanof Island, one (no. 9446), Kuiu Island, two (9447, 9448), Prince of Wales Island,

two, (nos. 9449, 9450), Etolin Island, four (nos. 9451-9454), Bradfield Canal, two (nos. 9455, 9456), Zarembo Island, one, (no. 9457), Mitkof Island, one (no. 9458), and the Taku River, two (nos. 9459, 9460).

Nos. 9452-9454, 9457 are in juvenal plumage, while nos. 9459, 9460, male and female, Taku River, September 10 and 12, are in complete first winter plumage, and apparently indistinguishable from adults. No. 9458, adult male, Mitkof Island, August 9, is in the midst of the annual molt.

Regulus calendula grinnelli Palmer. Sitka Kinglet.

Though seen throughout the region at many scattered points, the Sitka kinglet was nowhere at all common until late in the summer, when the young birds were flying about and the southward migration had begun. Single individuals were observed at various points on Kupreanof, Kuiu, Prince of Wales, Coronation, and Warren islands, and at Boca de Quadra and the Chickamin River on the mainland. On Mitkof Island, August 1 to 13, they were seen occasionally in the alders along the beach, evidently migrating and they were subsequently met with in steadily increasing numbers at Thomas Bay and Port Snettisham. On the Taku River, during September, they were seen daily, being far more abundant than at any other point. The character of the vegetation may have had something to do with their abundance here as they were almost always found in the alders or in other deciduous trees or shrubs, such as grow in abundance at this point, while the golden-crowned kinglet evinced a marked preference for the conifers.

A series of twenty-five specimens was secured (nos. 9421-9445). Of these two are adult males, nos. 9421, 9422, from Kuiu and Warren islands, respectively. Eleven are juvenals, nos. 9423-9432, 9436, and twelve, all from the Taku River, are immatures in complete first winter plumage. Some young birds taken the middle of August are already beginning to molt into this plumage, but one shot on September 9 (no. 9436) is still in the juvenal plumage throughout. Of the twelve in first winter plumage, eleven are males.

The juvenals are appreciably darker than specimens of

R. calendula cinereaceus in corresponding plumage from the mountains of southern California, being of a sooty olive-green cast, as compared with the decidedly grayish color of the latter. The immatures in the newly acquired winter plumage are of a noticeably deep tone of coloration. The immature males all have the red crown patch, though it appears to be the last of the plumage acquired; in the single immature female there is no trace of it.

Hylocichla ustulata ustulata (Nuttall).

Russet-backed Thrush.

Seen at very few points and in limited numbers. The first were observed on the Chickamin River, June 24, when several were seen or heard in the woods. I am under the impression that they had just arrived, for we had been at this point for a week without seeing any, while from then on they were heard almost every day. At Portage Cove, Revillagigedo Island, several were heard singing in the woods, at Bradfield Canal several were seen at various times, while on the Taku River two were observed on September 4, the last time that the species came under my observation. They were at all times exceedingly shy and difficult to approach, moving from place to place in the tree tops, and though frequently heard singing, it was but rarely that a bird was seen.

One specimen was secured, an adult male, shot on the Chickamin River on June 25 (no. 9363).

Hylocichla guttata nana (Audubon). Dwarf Hermit Thrush.

Quite generally distributed, and fairly common throughout the whole of the region, but during the spring and summer at least, very difficult to get sight of. They could be heard singing on all sides, especially about dusk, but it was only occasionally that I could catch a fleeting glimpse of a bird flitting through the shrubbery, or feeding on the ground under the thick bushes. The first arrival was noted at Kuiu Island, on May 4, and from then on they were seen or heard at practically every point visited. Points of record are as follows: Prince of Wales Island (Port Protection, Calder Bay, and Klawak Salt Lake), Corona-

tion, Warren, Dall, and Duke islands, Boca de Quadra, Chickamin River, Revillagigedo Island (Portage Cove), Etolin Island, Bradfield Canal, Zarembo Island, Mitkof Island, Thomas Bay, Port Snettisham, and the Taku River. Young birds in complete juvenal plumage were taken on Mitkof Island, early in August, one secured at Port Snettisham on August 28 has nearly completed the post-juvenal molt, and immatures taken on the Taku River the middle of September are in the first winter plumage throughout. Hermit thrushes were seen on the Taku River during the whole of our stay, during September, though their numbers diminished rapidly toward the end of the month.

Fourteen specimens of the dwarf hermit thrush were secured (nos. 9339-9352). Of these, six are adults, three in juvenal plumage, one undergoing the post-juvenal molt, and four immatures in complete first winter plumage. I had hoped to find *guttata* migrating at the Taku River, but the specimens secured there, as well as all the others, appear to be strictly referable to the form *nana*.

Planesticus migratorius caurinus Grinnell.

Northwestern Robin.

Observed at many scattered points, but seldom in any numbers. The first was noted on Kupreanof Island, April 19, when one was secured from a small flock, feeding in one of the parks. During the next few days several were heard singing in the tree tops about camp. A flock of eighteen or twenty was seen at Three-mile Arm, Kuiu Island, on April 26, and several were heard singing in the woods at Port Protection, Prince of Wales Island. On Coronation Island, May 14 to 18, at Port McArthur, Kuiu Island, May 18, and at Warren Island, May 19 to 23, robins were quite abundant, feeding in scattered flocks along the beaches, and evidently migrating. From then on until the end of the summer they were but rarely seen. At Duke Island, on the Chickamin River, and at Portage Cove, Revillagigedo Island, scattered individuals were observed, or heard singing in the woods. Juvenals were first seen at Mitkof Island, early in August, but they were always singularly wild and unapproachable. A very few were noted at Thomas Bay, and, on the Taku

River in September, they were occasionally met with in flocks of eight or ten individuals, usually very wild. Many were seen about the shipping at Juneau, September 30, and Hasselborg reported them as abundant at Game Cove, Admiralty Island, as late as November 8.

Nine specimens were secured (nos. 9322-9330), five adults and four juvenals. Of four adult males, two are in practically perfect adult plumage (nos. 9322, 9323), and two (nos. 9326, 9327, Coronation Island, May 17) are indistinguishable from average females. No. 9330, juvenal female, Taku River, September 12, has just begun the post-juvenal molt. On the whole the series bears out the characters ascribed by Grinnell (1909, p. 241) to the form *caurinus*. One of the two high plumaged males (no. 9322) has the terminal white spots on the outer rectrices unusually extensive, but as this same bird has many white feathers scattered over the head, neck and throat, large white tail spots may be merely a further manifestation of this albinotic tendency. The juvenals are appreciably darker, especially ventrally than are specimens of *propinquus* in corresponding plumage from Nevada, California and Arizona. Robins were observed on Mitkof Island and on the Taku River, feeding on the seeds of the devil's club (*Echinopanax horridum*).

Ixoreus naevius naevius (Gmelin). Varied Thrush.

Found throughout the region though abundant at but few of the points visited. First encountered on Kupreanof Island, April 17, when two were seen and one secured. No more were noted until we reached Port Protection, Prince of Wales Island, on May 6, when several were heard singing in the woods.

On Coronation and Warren islands, and at Port McArthur, Kuiu Island, many were seen feeding along the beaches, in company with the robins, and evidently migrating. Varied thrushes were subsequently seen, or heard singing in the woods, at Heceta and Dall islands, Boca de Quadra, the Chickamin River, Portage Cove, Revillagigedo Island, Etolin, Zarembo and Mitkof islands, Port Snettisham, and the Taku River. Many were noted on the wharves and among the shipping at Juneau, September 30.

Eight specimens were secured (nos. 9331-9338). Nos. 9331 and 9332, are adult males in breeding plumage; no. 9333 Mitkof Island, August 4, and no. 9336, Taku River, September 10, are in the juvenal plumage purely; no. 9334, Port Snettisham, August 31, and no. 9337, Taku River, September 4, are in the midst of the post-juvenal molt; while no. 9335, female, Taku River, September 4, is in the complete first winter plumage, and no. 9338, male, Taku River, September 13, has but a few juvenal feathers left.

Sialia currucoides (Bechstein). Mountain Bluebird.

Mountain bluebirds were occasionally met with along the Taku River during September, evidently migrating, and, toward the end of the month, in rapidly increasing numbers. The first were noted on September 8, two birds, one of which was secured. Two more were seen on September 11, and thereafter they were frequently observed, usually passing overhead, sometimes in flocks of twenty or more. Two specimens were secured, nos. 9320, 9321, male and female, respectively, both immatures in complete first winter plumage. These two individuals are of noticeably small size, as compared with specimens from more southern localities. They measure as follows:

No.	Sex	Wing	Tail	Culmen	Tarsus
9320	♂	107.5	63	12	20
9321	♀	111	64.5	13	20

This is, I believe, the first time that the species has been reported from the coast district of Alaska, if not from the territory in general.

CHECK-LIST OF THE MAMMALS.

1. *Odocoileus columbianus sitkensis* Merriam
2. *Orcamnos montanus columbianus* Allen
3. *Sciurus hudsonius vancouverensis* Allen
4. *Marmota caligata* (Esch.)
5. *Sciuropterus alpinus zaphaeus* Osgood
6. *Castor canadensis leucodontus* Gray
7. *Peromyscus maniculatus macrorhinus* (Rhoads)
8. *Peromyscus maniculatus hylaeus* Osgood
9. *Peromyscus sitkensis sitkensis* Merriam
10. *Evotomys phaeus* n. s.
11. *Microtus drummondi* (Aud. and Bach.)
12. *Microtus macrurus* Merriam
13. *Microtus coronarius* n. s.
14. *Fiber zibethicus spatulatus* Osgood
15. *Synaptomys dalli* Merriam
16. *Zapus hudsonius alascensis* Merriam
17. *Zapus saltator* Allen
18. *Erethizon epixanthum nigrescens* Allen
19. *Canis pambasileus* Elliot
20. *Lutra canadensis periclyzomae* Elliot
21. *Lutreola vison nesolestes* Heller
22. *Mustela nesophila* Osgood
23. *Putorius cicognani alascensis* Merriam
24. *Ursus americanus pugnax* n. ss.
25. *Sorex personatus streatori* Merriam
26. *Sorex obscurus longicauda* Merriam
27. *Myotis lucifugus alascensis* Miller

GENERAL ACCOUNTS OF THE MAMMALS: DISTRIBUTION, VARIATION, BIOGRAPHICAL NOTES.

Odocoileus columbianus sitkensis Merriam. Sitka Deer.

Probably in no other part of North America are deer as abundant as on the islands off the coast of southeastern Alaska; and this too despite the heavy mortality during the winter months. At every island visited, with one exception as noted beyond, deer were seen, without any effort on our part to hunt for them, and sign of various sorts was in evidence everywhere. At Kupreanof and Kuiu islands, during April, many were encountered, very thin, and in poor condition, and quite indifferent to approach. They were abundant on Coronation and Warren islands, and some were seen at various points on Prince of Wales and Dall islands, while on Heceta Island fresh sign was observed though no deer were seen during our brief stay. Several were seen on Duke Island, and we were afterward told that these deer were noted for their large size, as compared with those from other Alaskan points, but we failed to collect any specimens at this place. Portage Cove, on the east side of Revillagigedo Island, was the one island locality where deer appeared to be almost entirely

absent, tracks of a single individual seen far up the cañon, being the only evidence of the presence of the species. This is probably due to the fact that this place, in close proximity to the mainland, is subject to much more severe winters than are the more western islands. Deer are almost unknown along the mainland coast, a single buck seen by Hasselborg at Bradfield Canal being our only record. They were quite abundant on Etolin, Mitkof and Zarembo islands.

The Alexander Archipelago forms the northern limit of deer in North America, the comparatively mild climate of the islands permitting their existence, though they could not survive on the neighboring mainland. There is an apparent contradiction in the manner of their occurrence here. They are probably more abundant than at any other part of their range, and so conditions would seem to be favorable. But conditions are obviously unfavorable to this extent, that except in the mildest winters large numbers succumb to cold and starvation, while every year the majority of the deer finish the winter in a very enfeebled condition. Those seen early in April were emaciated to a degree, and too feeble and listless to make any great effort to get out of the way, while the woods were fairly strewn with carcasses. On the islands south of Frederick Sound the wolves also do much to reduce their numbers. At our first camp on Kupreanof Island I counted twelve dead deer on the beach within half a mile of camp, and probably half of these had been killed by wolves. At other points partly dismembered skeletons entangled in masses of windfall, and with the skin of the legs turned inside out, told of the tragedies enacted, even without the added suggestion from the bits of coarse black hair caught on the surrounding twigs.

Early in April the deer were feeding largely on the tender shoots of the skunk cabbage, about the first green vegetation to appear. A little later they were seen eating the green grass along the stream margins and in the meadows, but during the summer they seemed to subsist largely on the foliage of bushes and shrubbery in the woods. They frequently came down to the beaches, usually in the mornings and evenings, where several were seen eating seaweed, possibly for the salt. The woods were

everywhere intersected by a network of deer trails, extending in all directions. The narrow channels between the islands are evidently no barriers to this animal, for deer are found on every island of any size in the entire archipelago. To just what extent they continue to cross the wider arms of the sea it is impossible to say, but they were occasionally seen swimming long distances, and also observed on small islets in the bays which must have been just casually visited.

Four adult females were preserved (nos. 8336-8339), from Etolin, Zarembo, Mitkof, and Kupreanof islands. No bucks were preserved, those that were shot being in the process of shedding and having large areas quite naked of hair. They were without horns, of course, but shed antlers were frequently found wherever we went and I saved a number from Kupreanof, Kuiu, Coronation, Warren, Heceta, and Prince of Wales Island. Later in the year, in November, Hasselborg visited Freshwater Bay, on the east side of Chichagof Island, and near the northern extremity of the Alexander Archipelago, and he there collected a series of seven bucks which he sent to the Museum (nos. 8980-8986). Of four of these, the specimens consist of the entire skin with the skull; the other three, of the skin of the head and neck, together with the skull. He also sent in a shed antler from the same place. A comparison of the antlers of these deer with those from the more southern islands is of decided interest (see plate 3). The seven Chichagof bucks were all in the prime of life, all taken at the same place and at the same time, and their antlers are wonderfully uniform in size and shape. They are dark, reddish brown in color, rather stout, and beautifully symmetrical, more so than those of any other black-tail deer I have seen. Two of them have two prongs starting from the main antler, beside the short snag at the base, two have two prongs on one side and one on the other, while three have but one prong and the basal snag on the antler on each side. The striking point about them, however, is that not one of the series forks dichotomously, while of the shed horns picked up on the more southern islands, all do, except one or two small single-tined antlers. I examined in the field many shed antlers which we did not save, and all were of the same pattern. On the other hand I saw many mounted heads

in Juneau, most of them probably from Admiralty Island, and they were all similar to the Chichagof heads. So it seems that these differences between the antlers from the northern and southern islands are quite constant; but I am unable to appreciate any other differences between the deer from the different regions. The skins at hand are not comparable. The Chichagof bucks agree very closely with the description of a Kupreanof buck given by Dr. Allen (1903, p. 528). The principal difference lies in the white half collar on the lower neck, which is in some cases but faintly indicated, and in others entirely absent, leaving the whole neck uniformly brown below the throat.

Below are the measurements of the seven Chichagof skulls. For the sake of comparison I give the same measurements as those given of the Kupreanof bucks by Dr. Allen, in the paper cited above.

SKULL MEASUREMENTS OF *ODOCOILEUS C. SITKENSIS* FROM CHICHAGOF ISLAND, ALASKA.

Number	Total Length	Basal Length	Naso-occipital Length	Front border of Premaxillae to Front end of Nasals	Length of Nasals	Zygomatic Breadth	Post-orbital Constriction	Mastoid Breadth	Length of Upper Tooth Row	Length of Lower Jaw	Height at Condyles	Height at Coronoid Process	Length of Lower Tooth Row	Antlers: Length of Main Beam	Antlers: Distance between Points of Main Beam	Antlers: Across Point of Greatest Convexity
8980	272	240	220	64	70	112	72	97	68	203	70	104	72	380	325	410
8981	289	258	224	69	78	119	74	98	70	219	77	113	76	420	342	460
8982	281	244	212	73	63	113	74	95	68	203	74	111	72	416	213	400
8983	267	235	205	68	59	110	74	95	68	199	74	111	75	328	.....	362
8984	277	242	212	66	63	119	77	98	67	210	77	112	73	389	253	360
8985	275	244	211	69	64	109	73	91	67	203	76	112	73	400	308	373
8986	267	242	206	66	69	108	73	91	68	207	72	108	69	328	227	305

Oreamnos montanus columbianus Allen.

Columbian Mountain Goat.

Mountain goats occur at all suitable points along the mainland coast of southeastern Alaska, but apparently on none of the islands. They were first noted at Boca de Quadra, the first mainland point visited. Hasselborg made several long trips back into the mountains from our camp at the head of Marten Arm, and on June 13 he saw three goats, an old female with a kid, and a young female which he secured (no. 8335). It was in a bad place, high up in the cliffs, and the animal was shedding to such an extent as to be quite naked in patches, so he saved only the head, together with one hind leg for the meat. It was apparently a yearling, possibly the kid of the previous year of the old female with which it was associated, but nevertheless the meat was wonderfully tough, so much so as to require much boiling to make it edible.

On June 21 an old female with a kid was seen on a cliff at a point some ten or twelve miles up the Chickamin River, but in an utterly inaccessible place. At Port Snettisham old sign was abundant, and Hasselborg saw one goat but was unable to get a shot at it. None were seen on the Taku River in September, but Hasselborg returned to this place toward the end of October, and on one occasion saw seven goats at once, but was unable to cross the glaciers surrounding them.

Sciurus hudsonius vancouverensis Allen.

Vancouver Island Squirrel.

Red squirrels are found on such islands of the southern part of the Alexander Archipelago as lie close to the mainland, and on a few that extend far to the westward; being absent from those situated south of Summer Straits and west of Clarence Straits, of which Prince of Wales and Dall islands are the largest and most important. They occur on Kuiu, Kupreanof, Mitkof, Wrangell, Zarembo, Etolin, and Revillagigedo islands, specimens being secured or seen on all these islands. None were observed on Duke, Annette, or Gravina islands during the short time we

spent on them, but I should think it very possible that they occurred on the two latter. On the mainland, red squirrels or signs of their presence, were seen at practically every point we visited. (See text figure 1, page 153.)

Specimens were collected as follows: Kupreanof Island, eight (nos. 8761-8768), Kuiu Island, five (nos. 8769-8773) Revillagigedo Island, one (no. 8780), Etolin Island, two (nos 8781, 8782), Mitkof Island, two (nos. 8784, 8785); and from mainland points: Chickamin River, six (nos. 8774-8779), Bradfield Canal, one (no. 8783), Thomas Bay, one (no. 8786), and the Taku River, two (nos. 8787, 8788), a total of twenty-eight.

Those from Kupreanof and Kuiu, taken in April, are in winter pelage throughout. After leaving these islands no squirrels were secured until we arrived at the Chickamin River, the middle of June. Of the four adults secured here, three were molting from winter to summer pelage; the fourth (no. 8778) has completed the change, but is abnormal in coloration, having a tendency to albinism, evinced by small, scattered spots of pure white on the back, head and under tail surface. Two juvenals were taken here (nos. 8775, 8776), about two-thirds grown. The single specimen from Revillagigedo Island, shot July 4, is still in the winter coat, the new summer hair just beginning to appear upon the toes and feet. Of the two from Etolin Island, a female taken on July 6 (no. 8781) is largely in the winter pelage, while a male secured July 11 (no. 8782), is in summer pelage throughout. All collected later are in summer pelage.

On the islands inhabited by them these squirrels are quite numerous, apparently much more so than on the adjacent mainland, where the individuals are probably more widely distributed. On Kupreanof and Kuiu islands their shrill bark was frequently heard in the woods, but they were quite shy, and kept well out of sight. At this time they were feeding largely on various fungi and on buds and green stuff. Later in the summer, at the Chickamin River, Bradfield Canal, etc., they appeared to be living mainly on the spruce cones, the stripped scales of which formed large mounds under some of the trees. One shot on Mitkof Island was busily engaged in tearing strips of bark from some dead brush, possibly as material for a nest, as his

stomach was filled with a mass of berries, mushrooms, etc. Along the Taku River they remained in the alder thickets, these impenetrable tangles forming secure retreats, whence their shrill chatter could frequently be heard, though the squirrels themselves were but seldom seen.

The number of young produced at birth seems to be two; pregnant females shot the middle of April contained each two embryos, while the two juvenals secured on the Chickamin River were apparently of the same litter, and were the only ones seen at the place where they were secured.

Compared with a series of thirteen skins from Vancouver Island, all in winter pelage, these Alaska squirrels differ so slightly that it seems best to use the name *vancouverensis* for the form, though there appear to be certain appreciable differences. The Vancouver Island squirrels have larger ears, the upper surfaces of which are mostly brownish in color; while in the Alaskan squirrels they are black, in striking contrast to the color of the crown. The former are also not quite so heavily vermiculated with gray underneath. Two from Mitkof Island, in summer pelage, have some tawny fulvous underneath, but those from more southern points—Etolin Island and Chickamin River—are almost pure white below. These specimens are also the smallest of the series, and thus least like typical *vancouverensis* in all respects, though nearest it geographically.

In his description of *Sciurus h. petulans* Osgood (1900, p. 27) lays some stress on cranial characters, ascribing to that form a sharp indentation or notch on the orbital arch, which (by implication at least) he denies to *vancouverensis*. This feature is present in all the specimens I collected, in quite as great a measure as in examples of *petulans* from Glacier Bay. If it should prove to be constantly absent from the Vancouver Island squirrels it would be an effective means of distinguishing them from those living in southern Alaska. The Vancouver skins seen by me had the skulls inside, so they could not be examined.

Marmota caligata (Eschscholtz). Hoary Marmot.

Found at several points on the mainland, but at no island locality. The species has sometimes been considered as peculiar

to the Hudsonian, or to the Alpine-Arctic zone in this region, but from our observations its presence would seem to depend largely upon local conditions, open ground being the main requirement. At Marten Arm, Boca de Quadra, there was a small colony in a meadow at the edge of tide water. They were apparently quite rare at this point. On the Chickamin River Hasselborg found two colonies some distance up the stream, and secured an adult female and an unsexed juvenal. At Port Snettisham they were abundant, the only place where we found them so. Conditions were peculiarly favorable to their occurrence here, the mountain slopes being bare of trees to a great extent, and strewn thick with boulders, between which the marmots had their burrows (see plate 4, figure 2). Their shrill whistles were heard from morning to night and the animals themselves could be seen running to and fro, or keeping a lookout from the top of some jutting rock. They were distributed down to tide water. Many half to three-quarter grown juvenals were seen, comparatively tame and unsuspicious, but the adults were more wary and hard to approach. Two females were collected here, one adult, the other about half grown. On the Taku River Hasselborg reported hearing one whistle, the only one noted at this point. He ascribes their scarcity to the Indians, who are very fond of the meat. I ate two myself and found them quite palatable; they were both exceedingly fat.

The four specimens preserved (nos. 8358-8361) are not appreciably different from a series of *M. caligata* from the Prince William Sound region. They, as well as many others seen at close range, are quite uniformly colored, with black occiput and gray shoulders, shading into tawny on the hind quarters and tail, and none were observed that semed to approach at all the very dark colored *M. vigilis* of Glacier Bay (see Heller, 1909, p. 248).

Sciuropterus alpinus zaphaeus Osgood.

Osgood Flying Squirrel.

Two flying squirrels were secured during the summer. One was taken on Etolin Island on July 12 (no. 8789), and one at Bradfield Canal on July 22 (no. 8790). This is, I believe, the

first time that a flying squirrel has been reported from any island locality in Alaska, but it is such an absolute accident to run across them during the summer months in this region that they might well occur in comparative abundance and still be overlooked. I should consider it very possible that they might yet be found on such islands as Revillagigedo, Wrangell, Mitkof, or the Kake islands. They occur all along the mainland coast, where the Indians told us that they frequently catch them in winter in their marten traps, though they seldom see them in summer.

The one secured on Etolin Island entered the cabin I was occupying, and foraged in my boxes of provisions for several nights before it was caught in a rat trap. The Bradfield Canal specimen was taken in a rat trap set on the roof of an old Indian cabin at the edge of the woods. They are both old females which had apparently recently reared litters of young.

In coloration they are precisely alike, being, perhaps, a shade darker and richer brown than four specimens in the Museum collection (topotypes of *S. a. zaphaeus*) taken at Helm Bay, Cleveland Peninsula, in September.

Castor canadensis leucodontus Gray. Pacific Beaver.

Beaver sign, mostly quite cold, was found at many scattered localities, enough to indicate the former wide-spread distribution of the species over the larger islands of the group, and on the mainland. Incessant trapping has reduced their numbers to such an extent, however, that it is only in an occasional obscure locality that a few individuals still survive, usually living in the banks of a river, near the head of the stream. On Kupreanof Island fresh sign was seen some ten or twelve miles up the stream on which we were camped, but a party of Indians was trapping in the locality at the time. At Three-mile Arm, Kuiu Island, Hasselborg found some old dams at the head of the creek, but the beaver had apparently been gone several years at least, and the Indians trapping in the vicinity had caught none during the winter. On Prince of Wales Island old dams were seen at Port Protection, abandoned for many years, while at Klawak Salt Lake an Indian told us he had caught several during the winter. Hasselborg found indications of the presence of a few "bank

beaver'' at Boca de Quadra about five miles up a stream emptying into the head of Marten Arm; and at Portage Cove, Revillagigedo Island, he reported some cuttings of the previous year, found at the head of the creek. At Thomas Bay he found a chain of beaver ponds in the woods, but the beaver were gone; all but one solitary individual which had apparently been living there alone for several years. He left one front foot in a trap, but escaped with his life. On the Taku River, some fresh cuttings were seen.

As no specimens were secured the identity of this form with the Vancouver Island race *leucodontus* is of course merely conjectural.

Peromyscus maniculatus macrorhinus (Rhoads).

Rhoads White-footed Mouse.

Found at all the more southern mainland points visited, and on several of the more southern islands. The mice collected became less and less typical of *macrorhinus* as we advanced northward, and the species evidently intergrades with *hylaeus* at various points. In a general way Clarence Straits may be said to be the dividing line between the two forms in extreme southern Alaska, and typical *macrorhinus* was not found north of Wrangell Island.

Specimens were secured at the following points: Boca de Quadra, one (no. 8559), Annette Island, one (no. 8552), Gravina Island, six (nos. 8553-8558), Chickamin River, six (nos. 8572-8576, 9138), Revillagigedo Island, five (nos. 8568-8571, 9137), Etolin Island, seven (nos. 8561-8567), Wrangell Island, two (nos. 8539-8540), and Bradfield Canal, ten (nos. 8541-8551). The Museum collection also contains nine additional specimens from Etolin Island, and from Helm Bay, Cleveland Peninsula (nos. 449, 450, 456, 461-464, 469, 470).

Those from the more southern mainland points are apparently most like typical *macrorhinus*. Northward the size diminishes and intergradation with *hylaeus* appears to take place. The single specimen from Boca de Quadra is rather small; those from the Chickamin River, though clearly referable to this form, as is evident from the large size of the skulls, are, in their external

measurements, mostly within the maximum of *hylaeus*. Specimens from Bradfield Canal are of large size, but with rather light skulls. Those from Etolin and Revillagigedo islands are rather small, both externally and as to the skulls, but still much larger than typical *hylaeus*. Five adults (nos. 8553-8557) collected on Gravina Island, directly opposite Ketchikan, are almost exactly intermediate between *macrorhinus* and *hylaeus*, their measurements averaging: length 200.2, tail vertebrae 105.4, hind foot, 23.8. The skulls are likewise of an intermediate size. Any one of these specimens, taken singly elsewhere, might be referred to either of the two races, but on the whole, I believe they belong with *macrorhinus*. They clearly do so on geographical grounds, and, though they vary in the direction of *hylaeus*, there is no place where the ranges of the two races actually come together in this part of Alaska.

A single, imperfect specimen from Annette Island (no. 8552) is, I believe, also referable to *macrorhinus*, though even smaller (except its feet) than those from Gravina Island. In other places, as at Bradfield Canal and northward along the coast, intergradation appears to take place with *hylaeus* in varying degrees as the range of that race is approached.

On the whole the range of *macrorhinus* in Alaska may be said to lie along the mainland coast and on the islands east of Clarence Straits and Zarembo Island and, approximately, south of the Stikine River. (See text figure 3, page 156.)

Peromyscus maniculatus hylaeus Osgood.

Osgood White-footed Mouse.

Ninety-two specimens of this mouse were taken, from Kupreanof, Kuiu, Mitkof, Prince of Wales, Dall, Suemez, Heeeta, and Zarembo islands; and on the mainland at Thomas Bay, Port Snettisham, and the Taku River (nos. 8471-8538, 8577-8591, 9129-9136). The Museum collection also contains a large series from Admiralty Island, the form thus being represented from almost all parts of its known range.

Compared with Prince of Wales specimens, the mice from the outlying western islands—Heeeta, Suemez, and Dall islands—have rather large feet, measuring from 23 to 25 millimeters,

as compared with 22 to 23.5 in the former. One of the two specimens taken on Kuiu Island (no. 8485) also exceeds in every respect the maximum measurements ascribed to *hylaeus* by Osgood (1909, p. 54), its dimensions being as follows: length 213 mm., tail vertebrae 120, hind foot 24.

The Kupreanof mice, in cranial characters, resemble those from Prince of Wales less closely than do those from Admiralty Island, curiously enough considering their intermediate geographical position. The skulls of Admiralty specimens are indistinguishable from those from Prince of Wales Island, whereas those from Kupreanof are appreciably longer and more slender. Specimens from Mitkof Island in their slightly larger size show an approach to *macrorhinus*, as previously noted by Osgood (l. c.). The single example secured on Zarembo Island (no. 8560) is apparently to be referred to *hylaeus*. Those taken on the mainland at Thomas Bay, Port Snettisham, and the Taku River, are apparently all of this form. The single adult secured on the Taku (no. 8591) is rather large for *hylaeus*, but no more so than the Kuiu Island specimen mentioned above.

One specimen from Dall Island is abnormally colored in exactly the same manner as an example of *macrorhinus* described by Osgood (l. c., p. 57, footnote). This mouse (no 8497 ♀ Rocky Bay, Dall Island, May 31, 1909) has the entire under parts rich brown, similar to the sides. The hind feet are grayish, and the front feet white, while there are small white spots on the lips and on the center of the throat.

Although white-footed mice were taken at most of the places where we collected, there were but a few points where they were really abundant. As observed in this region, *hylaeus* and *macrorhinus* were exactly alike in habits and mode of life, and both seemed rather to favor the littoral zone. A beach well strewn with large drift logs, trees, etc., and thus affording plenty of shelter, was quite sure to yield a harvest of mice. Another place where they could generally be found was in the vicinity of cabins or human habitations of any sort, occupied or deserted, such dwellings in this region being almost invariably placed just above tide water. Elsewhere in the woods or meadows, it was a mere chance to secure them.

Peromyscus sitkensis sitkensis Merriam.

Sitka White-footed Mouse.

I took mice which I have referred to this species on Coronation, Warren, and Duke islands, these scattered localities still further emphasizing the peculiar distribution of the animal. (See text figure 3, page 156.) Four specimens were secured on Coronation Island (nos. 8592-8595), two in abandoned mine buildings, one in an old shed in the woods, and one in a *Microtus* runway. They were rather more numerous on Warren Island, where nine were trapped (nos. 8596-8603, 9128), all in *Microtus* runways. On Duke Island eighty traps produced three white-footed mice in three nights (nos. 8604-8606). No other species of *Peromyscus* was found on the islands where *sitkensis* occurs.

Osgood (1909, p. 103) has referred two examples from Forrester Island, Alaska, to *P. s. prevostensis* and possibly my specimens might be considered as belonging to that race, but the differences between the two forms are extremely slight, and the specimens under consideration show so much variation that it seems best to refer them to the stock form. They are smaller than typical *sitkensis* from Baranof Island though no more so than those from Chichagof Island. There are no appreciable color differences in the series from the different islands. While the skulls of some of my specimens show the somewhat elongated posterior palatine foramina supposedly characteristic of *prevostensis*, others are not different from typical *sitkensis* in this respect.

The specimens secured measure as follows:

No.	Sex	Length	Tail	Hind Foot	No.	Sex	Length	Tail	Hind Foot
8592	♂	201	97	26	8593	♀	190	93	26
8594	♂	210	102	26	8595	♀	188	90	25
8596	♂	212	109	26	8598	♀	185	84	25
8597	♂	206	105	25	8599	♀	181	87	25
8600	♂	205	101	26	8601	♀	190	98	24
8604	♂	207	100	26	8602	♀	208	107	25
8606	♂	212	108	26	8603	♀	182	90	24
					8605	♀	217	104	26

Evotomys phaeus, new species.

Dark-colored Red-backed Mouse.

Type.—Male adult no. 8742, Univ. Calif. Mus. Vert. Zool., Marten Arm, Boca de Quadra, Alaska; June 13, 1909; collected by H. S. Swarth; orig. no. 7647.

Characters.—Size rather large. Differs from *E. wrangeli*, nearest it geographically, in cranial characters and in much longer tail; from *E. caurinus*, the species to the southward in British Columbia, in larger size and longer tail.

Coloration.—Dorsal stripe dark brown, between chestnut and walnut brown, covering the whole back from the eyes to base of tail; not very sharply defined against the color of the sides. Sides and cheeks dark Isabella color. Below gray (about no. 8), sharply defined against the sides. Fairly conspicuous oval patches of gray hair over the hip glands. Tail bicolor, brownish above, yellowish below.

Skull.—Short and broad, with wide spreading zygomata. Rostrum short. Premaxillae usually extending slightly beyond posterior end of nasals. Frontals depressed.

Measurements.—Average of nine adults: total length 155.7 (149-164); tail vertebrae 51 (46-58); hind foot 19.9 (19-20). Skull: Average of eleven adults: length 24.8 (23-25.5); basal length 21.2 (19.5-23); zygomatic breadth 13.8 (13-14.8); mastoid breadth 11.1 (10.5-11.8); length of nasal 7.2 (6.8-7.8); length of upper tooth row 5.1 (5-5.2).

Remarks.—I had supposed that the red-backed mouse occurring on the mainland coast of this region would prove to be *E. wrangeli*, but the latter appears to be purely an insular species. I have had no specimens of that race for comparison, but the *Evotomys* secured differ so widely from it in all the essential peculiarities of the species as given in the published descriptions that there seems little doubt of their belonging to a different species. *Wrangeli* has a short tail, less than twice as long as the hind foot—in adults of *phaeus* the tail is invariably more than twice the length of the foot, frequently more than a third of the entire length of the animal. From *E. caurinus* of southern British Columbia it is distinguished by its generally larger size

and longer tail. The single specimen from Bradfield Canal has a noticeably more slender and elongated skull, with much lighter teeth.

We found red-backed mice at but three mainland points, and on none of the islands. At Boca de Quadra four were secured (nos. 8741-8744). These were caught in a thin line of spruce trees extending into one of the damp meadows, the scanty undergrowth below the trees showing here and there traces of faintly defined runways. The mice evidently were not abundant, as several nights trapping produced but the four specimens, and lines of traps in other similar places brought in nothing at all. On the Chickamin River they were rather more common, and during our stay there I secured fifteen (nos. 8745-8759). These also were all caught in scattered clumps of trees in the meadow land; there was little or no indication of runways, or other such evidence as is always to be found where meadow-mice (*Microtus*) are living. The only other place where the species was met with was at Bradfield Canal, where a single specimen, an adult female, was caught on July 24 (no. 8760).

Microtus drummondi (Audubon and Bachman).

Drummond Meadow-mouse.

This is a species belonging more peculiarly to the interior valleys east of the mountains, and it finds its way to the coast at apparently but very few points. We met with it only on the Taku River, a stream which forms a direct pass into the interior, and where other mammals, and birds also, were found, which properly belong to the fauna of the interior rather than to that of the coastal region. Bordering the river are miles of meadow land, and here these mice live in great numbers; in fact in no other place did we find any species of *Microtus* so abundant. Narrow, well-defined runways intersected the meadows in all directions, centering in little clumps of brush, or where a log or fallen tree gave shelter to the entrances of the burrows. They evidently avoided the comparatively dry woods near by, where none were caught, nor were any runways seen there, though at times the meadow land was flooded almost everywhere, and the runways resembled little creeks through the grass.

At this time, September, the mice were still breeding, and many of the females secured contained embryos, six or seven in number. Fifty specimens were obtained (nos. 8669-8713, 9121-9125) a large proportion of them being young of various ages. All are in summer pelage, short haired and rather shabby and worn in appearance.

Although I have considered these specimens as *M. drummondi* they are not typical of this species. In size they are uniformly very large, a peculiarity of northern examples of the species which has already been commented upon by various writers. The skull is large and heavy, with the exception of the audital bullae. These are actually smaller than in typical *drummondi,* proportionally much more so. The zygomata are wide spreading. It is decidedly suggestive that in all respects as they depart from typical *drummondi* they approach *Microtus admiraltiae* (Heller 1909, p. 256), and they might be considered as intermediate between the two forms, but for their strongly curved incisors, in which particular they have not varied. There can be little doubt however, that it is with this species that the affinities of *Microtus admiraltiae* lie, as seems evident from the relative geographic position of the two forms, as well as their close general resemblance.

Sixteen specimens of *Microtus drummondi*, eight males and eight females, taken on the Taku River, measure as follows: length, 157.4; tail vertebrae, 46.4; hind foot, 20.2. Skull: basal length, 23.2; zygomatic width, 14.7; mastoid width, 11.3; diastema, 7.9; length of nasals, 7.1.

Microtus macrurus Merriam. Olympic Meadow-mouse.

Possibly quite generally distributed over the southern part of the archipelago, though there were a number of islands where we failed to secure any, or to see any indication of their presence.

Sixty-two specimens were obtained (nos. 8609-8668, 9126, 9127) at the following points: Kupreanof Island, Kuiu Island (Three-mile Arm; Port McArthur), Prince of Wales Island (Port Protection; Calder Bay; Shakan; Klawak Salt Lake); Dall Island; Mitkof Island; and on the mainland at Bradfield Canal and Thomas Bay. At most points they were decidedly

scarce. On Kupreanof Island no runways were seen, and the few specimens secured were taken in the grass just above the high tide mark. At Kuiu Island there were a few small colonies on some little islands in the bay, but almost none elsewhere. The same was true at Port Protection, where most of those secured were taken on a little rocky knob, an island at high tide, though some meadows along a stream near by showed indubitable evidence of the presence of the meadow-mice during the winter months. At several other points similar conditions were encountered, indicating a seasonal shifting of the colonies from the meadow land, where extensive systems of runways were seen, with many burrows, and some balls of grass formed into nests and lying on the ground. The mice can move freely about under the snow that covers these meadows through the winter; but in the summer all such places were completely deserted, and nearly all the mice were on the little rocky islets, as noted above.

As we traveled south they became more and more scarce; assiduous trapping at three points on the west coast of Dall Island produced but a single specimen, and no runways were seen anywhere. On Annette Island many runways were seen in a little meadow, but they were all deserted, and no specimens were secured. On Suemez, Duke, Gravina, Revillagigedo, Etolin, Wrangell, and Zarembo islands no meadow-mice were secured, nor any sign of their presence observed, at the points visited, though they certainly may be supposed to occur at most, if not all of these places.

On Mitkof Island they were fairly abundant along the beach, though not nearly as much so as I expected, judging from the sign. They were feeding largely in the tall beach grass, inundated at high tide, and the receding waters carried out quantities of cut grass, so much so that it looked almost as though some one had been cutting hay in the vicinity. They apparently were living in burrows at the edge of the forest, which here as elsewhere, extends to the high tide mark, and travelled back and forth across the gravelly beach under the logs and other drift with which it is thickly strewn. Under these logs little piles of cut food were found, consisting mostly of two plants growing in abundance on the beach, *Arenaria peploides* and *Galium aparine*.

At Thomas Bay many well-defined runways were seen in thick growths of lupines, but they were apparently the work of but a few individuals, for only three were secured. The only other mainland point where the species was encountered was at Brad field Canal, where two were trapped under logs in the woods.

Very small juvenals were caught in the traps on Kuiu Island at the end of April, and thereafter in varying numbers and of all sizes at nearly every point where the species was encountered.

Alaskan examples of this mouse are uniformly quite small as compared with those from the type locality of the species, Olympic Mountains, Washington, judging from the published measurements of the latter. The specimens at hand from the Kake Islands, Prince of Wales, and Dall islands are all of about the same size, eleven adult males from Prince of Wales Island averaging: length 188.2, tail 73, hind foot 21.2. Curiously enough those from Mitkof Island appear to be a trifle smaller, although they were taken nearer the mainland than any others from island localities, and the mainland specimens are much the largest of the series. The five adults at hand from Bradfield Canal and Thomas Bay average: length 198, tail 78, hind foot 22.2.

Microtus coronarius, new species.

Coronation Island Meadow-mouse.

Type.—Female adult; no. 8721, Univ. Calif. Mus. Vert. Zool.; Egg Harbor, Coronation Island, Alaska; May 16, 1909; collected by H. S. Swarth; orig. no. 7487.

Characters.—Similar to *Microtus macrurus* in coloration and proportions but size very much greater throughout.

Coloration.—Essentially like Alaskan examples of *M. macrurus*, being perhaps a trifle grayer and less brown. Upper parts generally dark Vandyke brown, this color somewhat darkened and obscured by numerous overlying black hairs. Sides and that portion of the head anterior to and below the eyes much paler, nearer broccoli brown, this in turn changing rather abruptly to the dark gray of the entire under surface. Feet pale gray, almost white. Tail distinctly bicolor, upper surface darker and less brown than the back, under surface whitish.

Skull.—Like that of *M. macrurus* but much larger and more robust. I cannot perceive any difference in shape or proportions (see plate 5).

Measurements.—Type: length 215 mm.; tail vertebrae 84; hind foot 25. Average of five adult males: length 216.8 (208-232); tail vertebrae 81.6 (76-92); hind foot 25.4 (24-26); average of sixteen adult females: length 214.5 (203-232); tail vertebrae 83.9 (70-92); hind foot 25.1 (24-26).

Skull (type): basal length 27; zygomatic width 17.5; mastoid width 13.5; diastema 9; nasals 8.5. Average of twenty-one adults: basal length 27.2; zygomatic width 17.6; mastoid width 13.5; diastema 9.3; nasals 8.5.

Remarks.—This is a very distinct species, not requiring close comparison with any other Alaskan meadow-mouse. It is of about the size of *M. clymocetes*, but belongs, of course, to an altogether different section of the genus. It appears to be a gigantic insular development of *M. macrurus*, but none of the specimens secured show intergradation with that species.

We found it only on Coronation and Warren islands, two outlying and rather isolated islands on the western edge of the archipelago. It was rather abundant in the woods, where deep, well-defined runways intersected the mossy carpet in every direction. These runways generally led from the tangled roots at the base of some old tree to another similar location, and in such places we uncovered several nests, round balls of moss, some eight or ten inches in diameter. This apparently was the summer home of the species, for although there were runways and burrows in some little meadows bordering a stream on Coronation Island, the work was all old and the mice had apparently deserted the place. In these same meadows several old nests were found lying on top of the ground, composed of dry grass, and of about the same size and shape as the ones of moss in the woods.

At the time of our visit to the islands, May 14 to 18 on Coronation, and May 19 to 23 on Warren, no young ones were out yet and I believe that none had been born, though juvenals of *M. macrurus* had got into the traps several weeks earlier. Most of the females secured contained large sized embryos, from four to seven in number, but no females were taken which were nursing.

Twenty-two specimens were secured (nos. 8714-8734, 9120), seventeen from Coronation, and five from Warren Island, twenty-one of these being preserved as skins, and one in alcohol. These examples are quite uniform in every respect, and none exhibits any marked divergence from the general type. One or two have a greenish stain on the underparts, which is probably wholly adventitious, possibly caused by some of the wet vegetation in which they live.

Fiber zibethicus spatulatus Osgood. Northwest Muskrat.

A small series of muskrats taken at Portage Cove, Revillagigedo Island, are in many respects very similar to specimens at hand from Yukatat Bay, Alaska, and I provisionally refer them to this Alaskan race. Ten specimens of *spatulatus* from the Yukon Valley are more reddish in color, and apparently smaller, though there are no measurements with the skins. Compared with examples of *osoyoosensis* from northern Washington these island muskrats are paler colored and smaller, with short tails and proportionately large feet. The skulls are short, but very heavy and massive, with wide spreading zygomatic arches. The five specimens secured are quite uniform in size and color, as well as in the appearance of the skulls. They measure as follows:

No.	Sex	Length	Tail	Hind Foot
8355	♂	490	210	75
8356	♂	510	220	75
8354	♀	510	220	78
8357	♀	480	195	72
8353	♂	495	210	75

SKULL MEASUREMENTS.

No.	Sex	Basal Length	Zygomatic Width	Mastoid Width	Interorbital Constriction	Nasals	Diastema	Alveolar Length of Upper Molars
8353	♂	57	40	24	6.8	22	22	15
8356	♂	58	40.5	25.5	6.5	22	22.5	14.5
8355	♂	57.5	40	25	7	22.5	22.5	14
8357	♀	55.5	38.5	23.5	7	21	21	14
8354	♀	57	39.5	25	6.2	22.5	22	14.8

Revillagigedo Island was the only place during the entire summer where muskrats were encountered. The meadows border-

ing the river at Portage Cove were intersected by numerous winding gulches, large and small, formed by the various streams flowing down from the mountain sides, filled with water at high tide, and nearly empty at low tide. These gulches diminished in size as they left the river until they became mere narrow ditches, sometimes completely hidden by the tall overhanging grass; and here the muskrats had their home. There were not many of them, and Hasselborg, who discovered them, captured probably almost the entire colony at this point. Besides the five secured, one was eaten in the trap, probably by an otter. This seems to be an unusual place for them to winter, as all the swamps freeze solid, and there are no ponds. Old trails show that they have wintered on the surface of the meadows, under the snow, feeding on twigs, roots, grass and shoots.

The holes they were occupying were in the walls of the gulches, the entrances being under water at high tide (see plate 4, figure 1). About these holes and in their trails, were piles of cut grass, and other green stuff. No sign of muskrats was seen in the meadows along the Chickamin River, on the mainland directly opposite Portage Cove, in a region of very similar character.

Synaptomys dalli Merriam. Dall Lemming Mouse.

Six specimens secured (nos. 8735-8740), one from the Chickamin River, four from Thomas Bay, and one from Port Snettisham. At Thomas Bay the meadows in the river valley were strewn with logs and other drift brought down by the stream at high water, and it was under these that the lemming mice were captured. The single specimen from the Chickamin River was caught under a log in the woods, in a trap set for *Evotomys*. The one secured at Port Snettisham was taken high up on the mountain side, at the edge of deep snowbanks, in an open marmot meadow.

These six specimens are quite indistinguishable from a series of *S. dalli* from the Prince William Sound region, Alaska. Neither in external nor in cranial characters am I able to perceive any differences whatever, although it might be supposed that the form inhabiting this region would be *S. wrangeli*.

Zapus hudsonius alascensis Merriam. Alaska Jumping Mouse.

One specimen, an adult female, taken at Portage Cove, Revillagigedo Island, July 1 (no. 8607). It was caught at the entrance to a tiny hole in the moss at the base of a large tree near the edge of the forest. Numerous traps set in similar localities, as well as in the adjoining meadow land, failed to bring any additional specimens to light. The one secured contained six embryos.

This specimen was submitted to E. A. Preble, of the U. S. Biological Survey, who remarks that it "belongs to the *Z. hudsonius* group, and as it seems to have some of the characters of *alascensis*, I refer it to that form." Since the type locality of *alascensis* is Yakutat Bay, over three hundred miles northwest, south of which I believe it had not previously been taken, and since we secured a different species of *Zapus* at an intermediate point, it is desirable that more data be secured for the further elucidation of this peculiar irregularity in distribution.

Zapus saltator Allen. Stikine Jumping Mouse.

An adult male secured on the Taku River on September 8 (no. 8608). I believe they were fairly abundant in the meadows at this point, for on September 4 and 5 Hasselborg and myself saw probably half a dozen in the grass. When the rainy weather set in once more they were no longer to be seen.

The single example obtained, as well as the specimen of *Z. h. alascensis*, was identified by E. A. Preble.

Erethizon epixanthum nigrescens Allen. Dusky Porcupine.

Porcupines, or indications of their presence, were seen at almost every mainland point visited. At Boca de Quadra several were seen, and one killed but not saved as it was shedding badly. On the Chickamin River many were noted, all shedding hair and quills, some of them almost naked. There were many trails through the long grass at this point, made by the porcupines on their travels. At Bradfield Canal I saw but one, though the trees bore abundant evidence of their presence. At Thomas Bay they were fairly abundant. None were seen either at Port Snettisham nor on the Taku River, though there was a little sign at the

former place. The only island localities where the species was observed were on the neighboring Etolin and Wrangell islands, in close proximity to the mainland. On Etolin some sign was observed, and I found a dead porcupine in the woods, but we saw no living ones. On Wrangell, a number were observed.

But one specimen was preserved, an adult female taken at Thomas Bay on August 17 (no. 8352). This one is abnormal in coloration, possibly albinotic. The whole animal is of a yellowish color, about the clay color of Ridgway, becoming appreciably darker on the rump. The lower surface is a dark grayish brown. The short quills on the body are uniformly yellow, the larger ones on the rump and tail yellow basally, but abruptly darker at the distal end. The claws are of a dirty yellowish color. Other porcupines seen at the same place, and at other points, were all very dark, with the exception of one on Wrangell Island, which was also rather pale colored, though not as markedly so as the Thomas Bay specimen. The skull of the latter appears to be that of an old animal and exhibits the peculiarities ascribed to the form *nigrescens* by Allen, notably the fronto-parietal depression, together with the great development of the temporal ridges.

Canis pambasileus Elliot. Alaska Timber Wolf.

Wolves occur on all of the larger islands south of Frederick Sound, as well as along the mainland, and we found signs of their recent presence at most of the points we visited. About our camp on Kupreanof Island there were abundant tracks, apparently made by a single individual, while many of the dead deer scattered through the woods, had quite evidently been killed and devoured by wolves. At Three-mile Arm, Kuiu Island, one was heard howling in the night. More or less fresh sign was seen on Prince of Wales Island, at Port Protection and at Klawak Salt Lake, and at the latter place a skin was purchased from an Indian, who had killed the animal the same morning. This Indian informed us that wolves were particularly numerous on several of the islands lying west of San Alberto Bay, islands that we did not visit. Fresh tracks were seen on the beach at Heceta Island; and at Rocky Bay, Dall Island, wolf sign was

abundant. On the Chickamin River Hasselborg had a shot at one, at a point some twenty miles up the river, where he heard several howling in the night. Fresh sign was seen at Bradfield Canal and on Zarembo Island. A wolf remained in the vicinity of our camp at Mitkof Island during the whole of our stay at that point; I heard him howling in the night, and saw fresh tracks day after day, where he had followed me, making the round of my small mammal traps. Once also a deer burst from the woods near the camp, panting and panic stricken, and in evident fear of some unseen pursuer. At Thomas Bay one was heard howling, and his tracks seen almost daily along my line of traps; and though the Mitkof wolf was too suspicious to venture very near to the little mouse traps, this one was troubled with no such fears, but carried off several with the animals they held. Hasselborg reported seeing some wolf tracks at Port Snettisham. There appeared to be no wolves on Coronation, Warren, and Duke Islands; on Annette and Gravina islands we saw no sign; but our stay at these points was too short to decide any such matters. No wolf sign was observed on Revillagigedo, Etolin, or Wrangell islands, though they may occur on all three.

The one specimen secured is an old male, purchased from an Indian who had caught it in a trap at Klawak Salt Lake, Prince of Wales Island, on the morning of May 26 (no. 8321). He stopped at our camp the same day and exhibited the skin, which he had roughly removed, leaving the head, feet and tail unskinned. It was the second he had caught during the winter.

This animal is extremely dark colored, in general appearance almost black. The whole head and muzzle is glossy black, with a sprinkling of grayish, due partly to a mixture of white hairs, and partly to the fact that some of the black hairs are white basally. Back and legs are black, mixed with a few scattered white hairs; the sides of the neck brownish, and of the body dark gray, changing to dark brown on the middle of the abdomen. The tail is black, and black tipped, but about the basal half of the ventral surface is a dirty whitish color. The hair on the soles of the feet is chestnut. That on the median line of the back has not grown out to its full length, and the color of this part

is consequently a dirty yellowish brown, the worn remnant of the old coat, but the new hairs coming out are glossy black, with a few white ones intermixed. The captor, John Darrow, gave us much information about these and other animals, and told us that the wolves will sometimes even attack a bear. Several of the Indian hunters and trappers that I talked with expressed considerable fear of them, and they all gave exaggerated accounts of their ferocity and cunning. He also told us that he had twice killed pregnant females, each containing twelve embryos.

Several hunters, white men and Indians, told us that the island wolves were sometimes black, sometimes gray or yellowish, and sometimes a mixture of these colors. I saw several skins of Alaskan wolves at various times, and some were very dark, much like the one described above, some grayish, and a few gray or yellowish with black dorsal stripe and tail and a black mark across the shoulders.

The specimen secured measures as follows: approximate length of tanned skin from tip of nose to tip of skin of tail 1945 mm.; tail vertebrae 487; hind foot 304. Skull: total length 268 mm.; basal length, 229; zygomatic width 152; width across post-orbital processes 73; median length of nasals 97; palatal length 132; length of upper tooth row (anterior edge of canine to posterior edge of last molar) 110; length of canine 34; length of lower jaw 205; height of coronoid process 77.

Lutra canadensis periclyzomae Elliot. Island Otter.

Otter appear to be quite generally distributed over this whole region, but they have been so incessantly trapped that their numbers are greatly reduced. We saw more or less fresh sign at Kupreanof, Kuiu, Coronation, and Warren islands, and also on the Taku River. At Three-mile Arm, Kuiu Island, an Indian trapping there had caught just two during the winter. One specimen, a female, was secured by Hasselborg on Warren Island, May 19 (no. 8334) as it was swimming across a stream, when he saw it and shot at it with his 45-70 rifle. On skinning it no hole could be found, nor were any bones broken, and as its lungs were greatly congested, and it bled profusely at the mouth and nostrils, we concluded that the bullet must have struck the water immediately beneath the animal, the concussion killing it.

Lutreola vison nesolestes Heller. Island Mink.

Generally distributed over this entire region, and fairly abundant where they have not been trapped to excess. The mink is the Indian trapper's best standby on the islands, and wherever we went we found in the woods scores of little deadfalls of various ages arranged for their capture. One Indian at Three-mile Arm, Kuiu Island, had some thirty mink, one marten and two otter to show as the result of his winter's trapping. Hasselborg caught two mink at this point (nos. 8791, 8792), besides a third destroyed in the trap, probably by another mink, two at Egg Harbor, Coronation Island (nos. 8793, 8794), and one on the Taku River (no. 8795). I also purchased seventeen skulls from the Indian on Kuiu Island (nos. 8796-8812), and found an additional skull on Coronation Island (no. 8813).

More or less fresh sign was seen at many of the points visited, and I saw a mink running along the bank of a stream at Boca de Quadra, but failed to secure it.

The island specimens all exhibit to a marked degree the characters of *nesolestes*, the crowded tooth row, and greatly enlarged last upper molar. The single mainland example (no. 8795 ♀, Taku River, September 24), is much darker colored than any island specimens at hand, winter or summer, closely resembling a Prince William Sound example of *L. v. melampeplus* (no 858, ♀, Disc Island, September 4), but the dental characters are clearly those of *nesolestes*.

Mustela nesophila Osgood. Queen Charlotte Marten.

A single marten skull (no. 8814) was obtained at Three-mile Arm, Kuiu Island, purchased from an Indian who had caught the animal somewhere in the immediate vicinity. It is apparently most like *M. nesophila* of the Queen Charlotte Islands, from which it differs in slightly greater width, with especially wide spreading zygomata, judging from the published measurements and figures of the species(see Osgood, 1901, p. 33). The small audital bullae and short, heavy rostrum, with crowded upper tooth row and large sized last upper molar, all serve to distinguish it from the mainland forms. Should additional specimens

show the wide spreading zygomatic arches to be a constant feature, the marten of the Alexander Archipelago should be considered a distinct species.

The skull secured measures as follows: occipito-nasal length 77.5; basal length 75; palatal length 42; post-palatal length 33; zygomatic breadth 51.5; width across post-orbital processes 26; interorbital constriction 17.2.

We failed to obtain very definite information as to the distribution of the species over these islands, where it does not appear to be abundant at any point. The above mentioned individual was the only one caught during the season by the man who secured it, and he apparently knew of just one other captured in the vicinity during the same period. Tracks of a single individual were seen in newly fallen snow on Kupreanof Island; at no other point did we personally meet with the species.

Putorius cicognani alascensis Merriam. Alaska Weasel.

But three weasels were secured, all that were seen during the summer, one from Zarembo Island (no. 8815), one from Mitkof Island (no. 8816), and one from the Taku River (no. 8817). Our Indian friend at Three-mile Arm, told us that on the Kake Islands weasels were very scarce. During the past winter (1908-9) he had caught none; the winter before he got seven. The one secured on Zarembo Island entered my tent and carried away a shrew. It returned the next day, and catching sight of it in the wood pile I shot it. The Mitkof specimen was seen darting through a tangle of drift on the beach, and by squeaking in the manner commonly used in attracting small birds I easily induced it to return and expose itself. At this point I lost a number of mice, carried away or partially eaten in the traps, in a way that made me believe weasels were responsible.

Island specimens, compared with a single individual from Helm Bay on the mainland, exhibit the same dental peculiarities as do most of the other small carnivores of the islands, a noticeable crowding of the cheek teeth, together with an enlargement of the last upper molar, but two specimens from Juneau and the Taku River, have the same characteristics.

Ursus americanus pugnax, new subspecies. Island Black Bear.

Type.—Adult male; no. 8332, Univ. Calif. Mus. Vert. Zool.; Rocky Bay, Dall Island, Alaska; May 31, 1909; collected by A. Hasselborg; orig. no. 15.

Characters.—Differs cranially from *Ursus americanus americanus* from the adjacent mainland; skull broad and heavy, with the frontal bones conspicuously flattened. (See plate 6, figures 1 and 2.)

Remarks.—The island bear exhibit certain cranial peculiarities which seem to justify their separation as an insular race. They are certainly widely different from black bear taken at other Alaskan points, Kenai Peninsula, Yakutat Bay, and Taku Inlet. Compared with skulls from these localities, as well as with others from California and Oregon, the island specimens present a very different profile. The frontal bones are flattened and the sagittal crest raised, so that the highest part of the cranium lies very far back, about at the fronto-parietal suture rather than over the orbits, as in typical *americanus*. The post-orbital processes are largely developed and raised, being in one case actually higher than the intervening frontal region. The temporal ridges are conspicuous, and the zygomata heavily built and wide spreading, producing a relatively very broad skull. In three examples (nos. 8332, 8333, 8326) the zygomatic breadth is actually, as well as proportionately, greater than in any other specimens of black bear at hand, or than any published measurements I have seen. In general appearance these island skulls are short and broad, heavily built and conspicuously ridged. The larger ones bear a striking general resemblance to a grizzly skull from the interior of Alaska.

Their conspicuous feature is the flat depressed forehead. *Ursus a. carlottae* from the Queen Charlotte Islands has the cranium less arched than in *americanus*, but has an elongated skull, whereas in these it is short and broad. *Ursus americanus kenaiensis* (not *Ursus kenaiensis* Merriam, 1902) from the Kenai Peninsula has a long narrow skull (see Allen, 1910, p. 6).[1] Skulls

[1] Since the above was written Dr. Allen has proposed the name *Ursus americanus perniger* to replace his *U. a. kenaiensis* preoccupied. (See "Errata," Bull. Am. Mus. Nat. Hist., vol. xxviii, April, 1910, p. 115.)

in the collection of this Museum from the Kenai Peninsula, Yakutat Bay, and other mainland points in Alaska, have the frontal region high and rounded, a form of development that apparently is at its maximum in *Ursus altifrontalis* Elliot, from the Olympic Mountains, Washington. According to Allen (l. e., p. 5) one of the usual results of age in the black bear is "the marked building up of the frontal region." In these island bear age produces exactly the opposite effect, for through the development of the post-orbital processes and temporal ridges a decidedly more flat-headed appearance is presented in the older skulls.

In color the island bear secured are all black, and according to the Indians, the brown phase is unknown on the islands. It is not so on the mainland, however, where the cinnamon phase is fairly common, though this fact does not seem to be generally known (cf. Osgood, 1909, p. 3). At Marten Arm, Boca de Quadra, I examined over twenty bear skins in an Indian camp, all recently killed in the immediate vicinity, and over a third were in the cinnamon phase. The Indians, though they prize them higher than they do the black ones, as they fetch a better price, do not regard them as different species. A young female killed on the Taku River September 7 (no. 8328) is dark cinnamon brown in color, the legs and feet somewhat darker, and the under fur paler, with a white spot on the breast.

Eleven specimens of the black bear were collected, nine from island localities and two from the mainland, besides a skull picked up on Kupreanof Island. In detail they are as follows:

No. 8329, ♀ adult, Kupreanof Island, April 24. Hair very long and thick, as it is in winter pelage throughout. Black everywhere except on the muzzle, which is dark brown. Under fur dark gray, almost black.

No. 8330, ♂ young, San Alberto Bay, Prince of Wales Island, May 24. In very worn ragged pelage, the hair on the sides and shoulders being rubbed off to a marked extent. Black, except where the hair is much worn down, these areas having faded to a rusty brown.

No. 8331, ♀ young, San Alberto Bay, May 25. Also in worn pelage, though not so much so as the last. Hair largely rubbed

off on inner side of thighs and front of foreleg, the worn places showing rusty brown. Otherwise black, with slightly lighter colored muzzle.

No. 8332, ♂ adult, Rocky Bay, Dall Island, May 31. In worn winter pelage, with small patches of the new summer coat appearing on the inner sides of the thighs. Rusty brown on the sides, where most of the hair is worn off; otherwise black.

No. 8322, ♂ adult, Fools Inlet, Wrangell Island, July 12. All that remains of the old pelage is a line along the spine, and some ragged patches on the shoulders. On these areas the hair is longer than elsewhere, and differently colored, being rusty brown, whereas the new coat is glossy black with a few white hairs interspersed. Muzzle light tan color. A small pure white spot on the middle of the breast.

No. 8324, ♂ young, Mitkof Island, August 2. Very ragged in appearance, and presenting a mixture of old and new pelage. Black with slightly paler muzzle.

No. 8325, ♀ young, Mitkof Island, August 2. Also very ragged, with much of the old pelage remaining. The new hair black, the old rusty brown. Muzzle very dark, with lips slightly paler.

No. 8326, ♂ adult, Mitkof Island, August 4. In very worn pelage. Dull rusty black throughout.

No. 8327, ♀ young, Mitkof Island, August 8. Much like no. 8322, but with more of the long, rusty winter hairs on rump and shoulders. Otherwise glossy black with dark brown muzzle and a small white spot on the center of the breast. Very thinly haired.

No. 8323, ♂ young, Bradfield Canal, July 19. Very thinly haired. Summer pelage on the back, worn winter pelage on legs and thighs. Black, with under fur brownish. Muzzle and lips very dark brown.

No. 8328, ♀ young, Taku River, September 7. Dark cinnamon brown, with the legs and feet somewhat darker and the under fur paler. A small white spot on the breast.

We had heard rumors, more or less vague, in regard to the occurrence of brown bear on the more southern Alaskan islands, and one of the objects of the present expedition was to ascertain as

definitely as possible the range of the big brown bear in this region. Hasselborg is familiar with them, and with their habits and mode of life, having hunted them in other parts of Alaska, and at each point we visited he made it his first object to hunt for bear or signs of their presence. We also questioned prospectors and storekeepers as well as the Indians at every opportunity. There can be no doubt, I believe, that the brown bear do not occur south of Frederick Sound and Christian Sound, on the islands, while on the mainland coast we had not the slightest evidence of their presence anywhere south of Juneau. The Indians on the Kake Islands and on Prince of Wales use the same names as the more northern tribes for the brown and the black bears, but those we interrogated all declared that there were none of the former on their islands.

On the mainland, where the cinnamon phase of the black bear is of fairly common occurrence, the Indians refer to the cinnamon colored individuals as brown bear, but they distinguish between these and the big northern brown bear, referring to the latter as the "fighting brown bear." Both white men and Indians declared that there were no large bear immediately along the coast on the mainland, nothing but black bear, though there were grizzlies twenty or thirty miles inland, in a few places. I saw some grizzly skins that had been obtained about that distance from the mouth of the Stikine River, and at the head of Port Snettisham, and on the Taku River Hasselborg saw tracks of what he believed were grizzly bear.

Black bear are generally distributed over all the larger islands from Kupreanof southward, and all along the mainland coast. Specimens were secured or signs of the very recent presence of bear seen on Kupreanof, Kuiu, Prince of Wales, Heceta, Dall, Revillagigedo, Etolin, Wrangell, and Mitkof islands, and at all the mainland points visited. They appeared to be absent from Coronation, Warren, Duke, and Zarembo islands. The material at hand is not sufficient to demonstrate whether the island bear ranges along the mainland coast immediately adjacent. Several skulls from the Taku Inlet, all of rather young individuals, however, have high, rounded frontals. The young cinnamon bear secured at this point in September (no. 8328) has this part as flat as any of those from the islands.

Upon our arrival on Kupreanof Island, early in April, snow lay deep in the woods, and even along the beaches, and Hasselborg declared that while some of the brown bear should have emerged from their hibernation, it was still too early for black bear. On April 14 he found fresh tracks of one, and on the 16th he seared what was probably the same bear from a thicket in which it was sleeping, but failed to get a shot at it. On April 24, while hunting in the same place, he secured this bear, a female, probably two or three years old, in good condition, and very fat. All the tracks that were seen at this point were apparently made by this one bear. The weather was so cold and stormy that it is doubtful whether very many had come out yet. At Three-mile Arm, Kuiu Island, fresh tracks of a single bear were seen.

At Port Protection, Prince of Wales Island, Hasselborg found sign of several individuals, but they were ranging over the country, hunting for green grass, which was just beginning to appear in places. At San Alberto Bay, Prince of Wales Island, he secured two, on May 24 and 25 respectively, along the same stream, where they were eating the grass which was now quite tall. The next place where bear sign was observed was at Rocky Bay, Dall Island. They were fairly numerous in this region, and apparently the Indians had not been hunting or trapping there recently. On May 31 Hasselborg secured an adult male, the largest and best specimen obtained. At most of the places visited subsequently the Indians had been trapping earlier in the season, and the bear killed or frightened away. However, on Mitkof Island we found a place where they had not been disturbed, and where they were feeding on the running salmon. Hasselborg saw seven during our stay here, and secured four of them.

Early in the season, when they first came out of their holes, the bear were feeding on grass wherever they could find it, and we also found many places where they had dug up and eaten the roots of the skunk cabbage. The one killed on Kupreanof Island had been feeding largely on the dead deer strewn throughout the woods, and one was found that may have been killed by the bear itself judging from the blood and the appearance of the carcass. This bear's stomach was stuffed with deer hair, hoofs and pieces of bones, together with some skunk cabbage roots and grass.

The one killed on Dall Island contained steel-head trout and grass. By the time we reached the Taku River, in September, the run of salmon in the smaller streams was over, and the bear had scattered over the country.

According to the Indians, the island black bear are much more savage and ferocious than those on the mainland, a statement that is borne out to some extent by the summer's observations. They told us that the island bear would not hesitate to attack a man when wounded, and that they generally rushed right in and seized him, not rearing up on their hind legs in the usual manner of the brown bear. The old male that Hasselborg secured on Dall Island rushed for him at the first shot, very much to his surprise, as he had frequently expressed his contempt of the fighting ability of the black bear. It would have been easier for this animal to have made his escape in almost any other direction, for he had to go around a fallen tree and cross a running stream some two feet deep in order to reach his assailant, but he doggedly kept on in spite of several bullets, finally dropping dead on the sandbar, within thirty feet of the hunter. This bear had had his lower jaw fractured, a triangular piece of bone containing the left canine which is also broken square across, hanging loose, attached only by the skin and muscles. This injury had been received apparently not more than two weeks before, and it had very possibly been done in a fight with another bear, for there were numerous partly healed wounds on his neck and body.

Another individual, also an old male, killed on Mitkof Island (no. 8326), had undergone a still more frightful injury, the lower jaw on the left side being fractured squarely across, immediately before the last molar, which had dropped out. The only external indication of this injury was a running sore on the jaw. From the appearance of the bone this wound must have been received months before.

In connection with the present study of the Alaska black bears I took occasion to carefully examine the series of *Ursus emmonsi* contained in the Museum collection. These are seven in number, consisting of the following specimens: three skins with skulls, one skin with the complete skeleton, two skins without skulls, and one skull without the skin. The theory has

recently been advanced by Osgood (1909, pp. 1-3) that possibly the glacier bear is not a species, nor even a subspecies, but merely a color phase of *U. americanus.* This idea would seem to be distinctly worthy of consideration, for the distinguishing differences of *emmonsi* are of color only, and in this it seems to be extremely variable. That as a gray phase of the black bear it replaces in Alaska the common cinnamon phase is not borne out by the facts, however; for as mentioned above brown colored examples of *U. americanus* are of fairly common occurrence on the southern mainland coast. *Emmonsi* has a curiously limited distribution, specimens having been taken only in the region lying between Lynn Canal and Cape St. Elias. Indians that we questioned in the regions farther south knew nothing of a blue-colored bear, having never seen or heard of any such animal, and such evidence though negative, is worth taking into consideration. Hasselborg informed me that the Yakutat Bay Indians, though aware of their existence did not regard them as different from the black bear. When pressed for an explanation of the peculiar color they expressed their belief that the gray bears were the very old individuals. Of course while their opinion as to the specific standing of the bear is of little or no value, it is of interest as illustrating the nature of the differences between *emmonsi* and *americanus.* They occur in the same region, and appear to be alike in their habits, despite the supposed predilection of the former for the vicinity of glaciers.

The color of the fur appears to be the only distinguishing characteristic. I am unable to appreciate any difference between skulls of *emmonsi* and those of *americanus* from Yakutat Bay, nor do I find the alleged differences in the claws (supposedly smaller and more curved in *emmonsi*) to be borne out in the specimens at hand.

In view of the rarity of the species it seems worth while to place on record brief descriptions of the skins contained in the Museum collection.

No. 4331, ♀; Anklin River, Yakutat Bay; May 6, 1908; collected by A. Hasselborg. Skin and skull. Very pale; general body color creamy white. Rump, legs and feet darker, being dark, bluish gray. Toes black, but with scattered white hairs. A dark line from the head along the middle of the back, becoming less dis-

tinct posteriorly. Inner surface of ears black; basal two-thirds of outer surface whitish; tip black. Head, before the ears, abruptly darker, black, mixed with many pure white hairs. Muzzle and chin brownish, from a line a little before the eyes.

No. 4369; Fairweather Range, Lituya Bay, 1906. Skin only. General color creamy white; lower part of fore legs mixed with black hairs, producing a somewhat darker effect; toes abruptly black. An indistinct dark line along the middle of the back, disappearing anteriorly and posteriorly. Ears whitish, edged with black. Head darker, but not black, mixed whitish and black hairs extending forward to the eyes. Muzzle and chin brownish.

No. 4368; Fairweather Range, Lituya Bay; 1906. Skin and skull. General color dirty whitish, palest on neck and sides of body, bluish gray on legs, rump, and along the back. Head darker, mixed black and white hairs extending forward to a line just before the eyes. Chin and muzzle brownish.

No. 4370; Lituya Bay, near Mt. Fairweather; spring of 1906. Skin only. Color of body bluish white, palest on neck and shoulders; darkening on the posterior part of the back, the rump, legs and feet. Upper part of head abruptly darker, being black interspersed with many long white hairs. Ears black. Muzzle and chin brownish.

No. 4371, ♀; base of Mt. Cook; June 1, 1907. Skin and skull. Dark bluish gray, palest on shoulders and abdomen, darkest on rump, legs and feet. Upper part of head black, mixed with white hairs. Muzzle and chin brownish.

No. 4367; Fairweather Range, Lituya Bay; 1907. Skin and skeleton. The darkest of the series. Very dark bluish gray, with no whitish anywhere. Palest on shoulders, darkest on legs and rump. Feet and toes black. Upper part of head black, silvered with many white hairs. Chin and muzzle brownish.

MEASUREMENTS (IN MILLIMETERS) OF BLACK BEARS

No.	Locality	Sex	Length	Hind Foot
8329	Kupreanof Island	♀	1422	228
8330	Prince of Wales Island	♂	1524	254
8331	Prince of Wales Island	♀	1371	228
8332	Dall Island	♂	1752	266
8322	Wrangell Island	♂	1422	241
8323	Bradfield Canal	♂	1371	228
8324	Mitkof Island	♂	1422	254
8326	Mitkof Island	♂	1574	254
8325	Mitkof Island	♀	1371	228
8327	Mitkof Island	♀	1270	203
8328	Taku River	♀	1141	203

MEASUREMENTS IN MILLIMETERS OF 12 SKULLS OF *URSUS A. PUGNAX.*

No.	Sex	Basilar Length	Palatal Length	Post-palatal Length	Zygomatic Breadth	Width across Post-orbital Processes	Length of Nasals	Posterior edge of Alveolus of Canine to Posterior edge of Alveolus of last Upper Molar	Crown of last upper Molar	Ratio of Zygomatic Breadth to Basilar Length
8332	♂	284	157	127	206	123	79	86.5	28	72.2
8326	♂	269	144	125	195.2	113	76	85	27.5	72.8
8333	..	277	149.4	127.6	192	108.5	82.5	80	26	69.4
8329	♀	248	132	116	153.5	86	76.5	79.3	26	61.9
8324	♂	241.6	132.4	109.2	151.5	79.7	69	79.5	27	62
8325	♀	224.8	126.3	98.5	.....	77.5	76.7	74.5	25.7	....
8327	♀	226.2	124	102.2	138	74	60.2	77	27.4	62
8322	♂	258	133.5	124.5	176	103.4	78	81	28.5	68.2
8331	♀	242	137	105	151	83.6	77	80.4	25	62.4
8330	♂	254	141.5	112.5	167	93	74	83.5	27.5	65.8
8323	♂	228.5	126	102.5	142	81.5	69.5	77.5	26.7	62.2
8328	♀	199.5	110	89.5	125.5	65	51	65	23.8	62.9

Sorex personatus streatori Merriam. Streator Shrew.

Represented by a series of twenty-eight specimens from various mainland points and from some of the islands lying close to the coast (nos. 8412, 8422, 8425, 8430, 8431, 8434-8444, 8450, 8461-8463, 8465-8470, 9154, 9155). No specimens were taken on any of the more western islands. Points of capture are as follows: Chickamin River, 1; Portage Cove, Revillagigedo Island 1; Etolin Island 1; Wrangell Island 2; Bradfield Canal 11; Mitkof Island 1; Thomas Bay 5; Port Snettisham 2; Taku River 4.

Sorex obscurus longicauda Merriam. Long-tailed Shrew.

Generally distributed over the whole of this region, and in many places the most abundant species of mammal. Ninety-two specimens were secured from the following localities: Kupreanof and Kuiu islands, Prince of Wales Island (Port Protection, Calder Bay, Shakan, San Alberto Bay, Klawak Salt Lake), Coronation, Warren, Heceta, Duke, Gravina, Dall, Revillagigedo, Etolin, Wrangell, Zarembo, and Mitkof islands, and from the mainland at Boca de Quadra, the Chickamin River, Bradfield Canal, Thomas Bay, Port Snettisham, and the Taku River (nos. 8365-8411, 8413-8421, 8423, 8424, 8426-8429, 8432, 8433, 8445-8449, 8451-8460, 8464, 9153, 9156-9166). It was thus found at practically every point visited.

Where meadow-mice occurred shrews were frequently taken in their runways, but they were also caught in traps set in almost every conceivable situation, under logs in the woods or amongst the drift on the beaches. Almost as many were caught in the daytime as at night, and in some places they were a source of annoyance, eating portions of animals caught in the traps. At Thomas Bay I watched one for some time, feeding in refuse by the camp. I had just cleaned some ducks, and the clotted blood lying on the ground attracted the shrew to the exclusion of everything else. He tugged and pulled at it, eating all he could hold, while I stood watching, standing within a foot of him, and though the least sound or movement on my part

sent him darting into the grass, he quickly returned, and eventually finished his meal.

I have referred all of these shrews collected to *longicauda* although there is considerable variation in the size and proportions of the series from different points. Those from most of the more northern and western islands average rather small and have short tails, as compared with those from more southern island and mainland points. Two examples from Boca de Quadra are particularly large. The largest of these (no. 8409, female) measures: length 140; tail vertebrae 62; hind foot 17. Various intermediate sizes may be found between this and the smaller, more northern individuals, however. There is no apparent color variation in the series from different points.

Myotis lucifugus alascensis Miller. Alaska Brown Bat.

Bats were seen at but two points, at the head of Marten Arm, Boca de Quadra, and at Portage Cove, Revillagigedo Island. At the former place perhaps six or eight were observed, usually flitting about some sheltered corner at the edge of the woods, where it became dark sooner than out in the open meadows. At Portage Cove they were quite numerous, but usually feeding over the surface of the river, and consequently hard to retrieve. I looked for them carefully at the other places visited, but saw none.

Seventeen specimens were collected (nos. 8362-8364, 9139-9152). At Boca de Quadra I shot one which I made into a skin, and Hasselborg shot two which were put in alcohol. At Portage Cove I made skins of two, and Hasselborg secured twelve which were saved in alcohol.

DISTRIBUTIONAL CONSIDERATIONS.

Groups of islands usually present interesting facts and problems in the distribution of animal life, taken in connection with the conditions on the neighboring mainland, and the Alexander Archipelago is no exception to this general rule. The present expedition together with the previous one to this same region, has brought together many specimens and recorded many facts of significance along these lines. The present distribution of animals on these islands is in many cases difficult or impossible

to explain satisfactorily, though in some instances the causes of the present conditions are fairly obvious.

The relationships of the vertebrate fauna of the Sitkan district are for the most part distinctly with the mainland region to the southward, the temperate climate of the coast having permitted this northern extension of the ranges of many species of birds and mammals. The greater part of the area included is composed of islands, the strip along the mainland between the mountains and the sea being narrow and restricted. Though the fauna of the various islands has, as a rule, apparently been derived from the adjacent mainland, there are several exceptions, as noted beyond, some of them difficult to understand.

The northern islands of the group are separated from the more southern ones by broad, deep channels, and many of the mammals of these islands are more closely related to more northern mainland forms. Of the southern islands those lying closest to the mainland have the greatest number of mainland species.

Island forms of several species are somewhat smaller than the mainland races, but it is remarkable that on the westernmost islands, those farthest from the mainland, these same species should be represented by exceedingly large races.

Climatic and physiographic conditions are quite uniform throughout the whole of the area under consideration, which is a region of rough, precipitous mountains and impenetrable forests, and is likewise noted for its copious rainfall and comparatively mild climate. The most noticeable local climatic variation is between the mainland and the more western islands. The winter climate of the mainland coast, though much milder than that of the region east of the mountains at the same latitude, is more rigorous than that of the islands. The islands nearest the coast, as Revillagigedo, are on their east sides also subject to severe winter weather. One of the results is that on the mainland the heavy precipitation of the region takes the shape of snow which covers the ground to such a depth as to render impossible the presence of animals like the deer. Despite the general uniformity of conditions it is interesting to note that with one or two possible exceptions there is no species of mammal that ranges unchanged throughout the whole of the region. With

birds it is different. Excepting the singular distribution of the grouse on the islands, the avian fauna is everywhere much alike.

For the purpose of this discussion the islands of the archipelago may be roughly divided into three groups: northern (Chichagof, Baranof, and Admiralty), central (Kuiu, Kupreanof, and Mitkof), and southern (Prince of Wales and the islands to the westward). Zarembo possibly belongs in the latter category, while those islands lying east of Clarence Straits are, as regards their animal life, most like those of the central group. In the first group we find several species of mammals apparently of

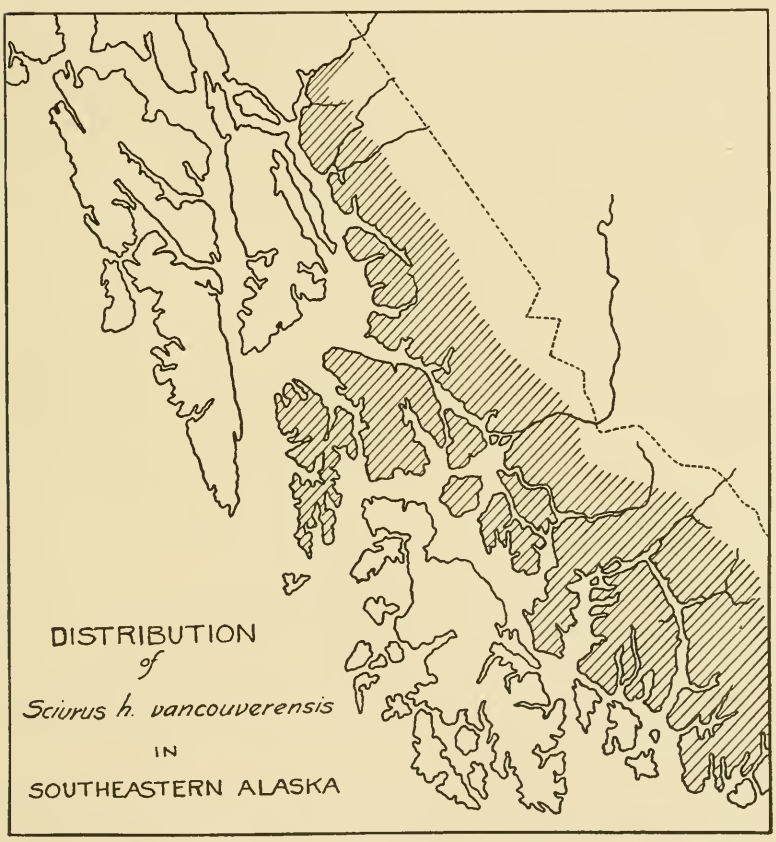


Fig. 1.—Map showing the range of the red squirrel (*Sciurus hudsonius vancouverensis*) in southeastern Alaska. It has invaded only the islands most easy of access from the mainland.

northern derivation. Here the big Alaska brown bears find their southern limit at Frederick Sound and Christian Sound. *Microtus sitkensis* is closely related to more northern forms, while *M. admiraltiae* is curiously enough an offshoot of an inland species (*M. drummondi*) that reaches the Alaskan coast at very few points—one of them being that part of the mainland most closely adjacent to Admiralty Island.

The central group of islands, though extending to the western edge of the archipelago, is nevertheless but narrowly separated from the mainland, and it contains one characteristic mainland mammal (*Sciurus*) that does not occur on either the northern or the southern group. (See text figure 1, page 153.) These islands centrally located, are in a sense a meeting ground of the faunas of the surrounding regions. Besides the aforementioned squirrel they contain the sooty grouse found on the islands to the north but not on those directly southward, and also the black bear, of which the reverse is true.

The southern group is distinguished by the absence of the red squirrel, and the presence of the black bear and wolf, which find their northern limit on the islands at Frederick Sound; but the most conspicuous feature of this group is the fact that on these islands the spruce grouse (*Canachites*) occurs, to the exclusion of the sooty grouse (*Dendragapus*), of general distribution elsewhere in the region. (See text figure 2, page 155.)

The islands lying east of Clarence Straits are mostly but slightly separated from the mainland, and contain many mainland forms—*Evotomys* on Wrangell and Revillagigedo, *Synaptomys* on Wrangell, *Zapus* and *Fiber* on Revillagigedo, *Erethizon* on Etolin and Wrangell, *Sciuropterus* on Etolin, and *Sciurus* on all of them. That the jumping mouse of Revillagigedo Island should prove to be of the *Zapus hudsonius* group seems remarkable, as this is hundreds of miles south of the previous known range of this species and as an entirely distinct species occurs at intervening mainland points.

Coronation and Warren, two small outlying islands west of Prince of Wales, present some curious and interesting conditions. Coronation lies close to Kuiu, and Warren close to Prince of Wales, being more widely separated from one another than they

are from these adjacent islands. They have one species of mammal (*Microtus coronarius*) common to the two, and as far as known occurring nowhere else; and one other species (*Peromyscus sitkensis*) found on both which is not found on either of the large islands closest to them. The sooty grouse

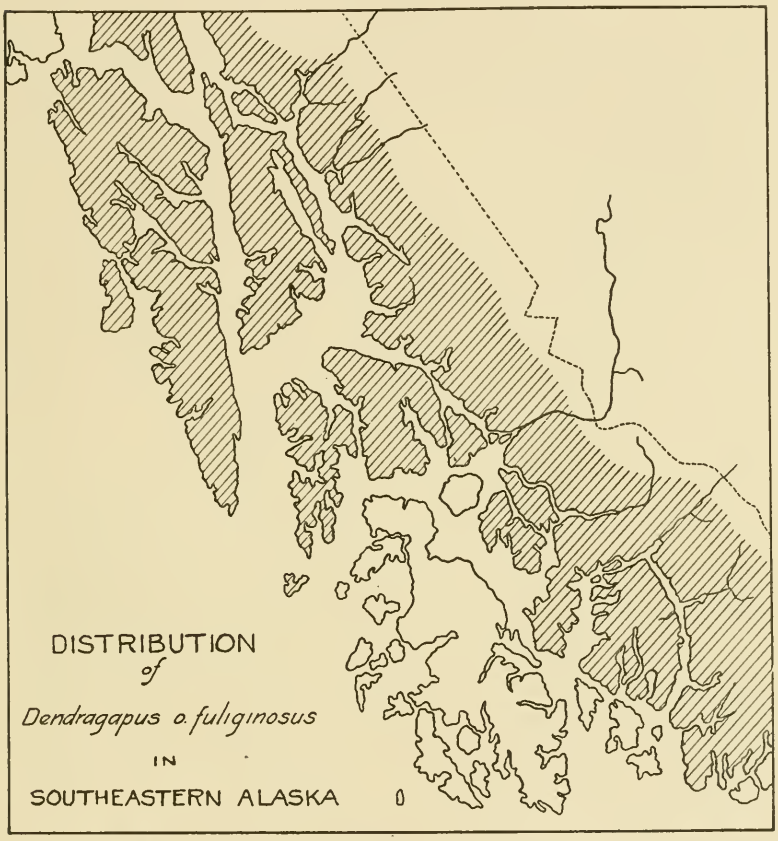


Fig. 2.—Map showing the range of the sooty grouse (*Dendragapus obscurus fuliginosus*) in southeastern Alaska. It occurs on some of the more remote western islands of the archipelago, but is absent from others lying nearer the mainland.

(*Dendragapus*) is found on Coronation Island, but is absent from Warren where apparently the spruce grouse (*Canachites*) occurs. What the obstacle may be that stops a strong flying bird, and yet permits the passage of small and feeble terrestrial mammals it is hard to imagine. It is of interest to note in this connection

that at our camp on the *east* side of Warren Island the beach was strewn with the wreckage of a ship that had gone on the rocks on the *west* side of Coronation Island some months previously. Although the two islands lie on different sides of a channel through which the prodigious tides of the region rush

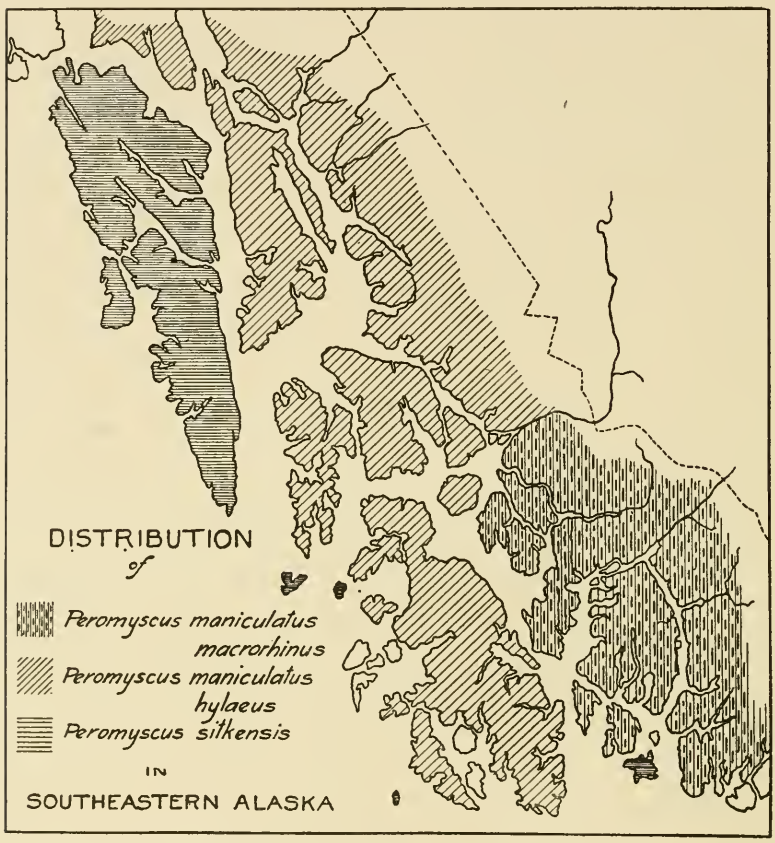


Fig. 3.—Map showing the distribution of the species of *Peromyscus* in southeastern Alaska. Vertical lines indicate the range of *P. maniculatus macrorhinus*, diagonal lines, *P. m. hylaeus*, horizontal lines, *P. sitkensis*. Note the peculiarly disconnected range of *Peromyscus sitkensis*.

back and forth twice daily, it is evident from this fact that it is quite possible for something to drift from Coronation to Warren, at any rate.

The distribution of the mouse mentioned above (*Peromyscus sitkensis*) is in itself of considerable interest (see text figure 3,

page 156); in fact there is probably hardly another North American species of mammal with so extraordinary a range. It is known to occur on Chichagof, Baranof, Coronation, Warren, Forrester, and Duke islands, in Alaska, and on Prevost Island, at the southern extremity of the Queen Charlotte group. (The Prevost Island mouse has been separated as a slightly differentiated subspecies, *P. s. prevostensis* Osgood, and Forrester Island specimens considered as of this form, but for the purposes of this discussion they may be considered the same.) These islands are most of them widely separated, between Duke and Forrester and between Duke and Coronation and Warren lie whole groups of islands inhabited by a different species (*P. m. hylacus*), while those islands nearest to Duke contain still another species (*P. m. macrorhinus*). Between Forrester and Prevost lies the entire group of the Queen Charlotte Islands. It might be argued that the mice of these various islands are really distinct species developed similarly through similar conditions and that their present appearance does not indicate their true relationships, but it is hard to appreciate how these particular islands differ from the scores of others in the region sufficiently to have produced such results. No other *Peromyscus* has been found on the islands where this form occurs.

Some interesting comparisons can be drawn regarding the distribution of the species of *Microtus* and *Peromyscus* in the southern part, at least, of the Sitkan district. In each the species arrange themselves, roughly, in parallel north and south lines. In the white-footed mice we find on the mainland, and on those islands lying closest to it, a large, robust form, *Peromyscus maniculatus macrorhinus*. A little farther west, throughout the middle line of islands, reaching the mainland in the northern part of the region, is a much smaller variety of the same species, *P. m. hylacus*. Still farther west on the outlying islands, is an exceedingly large mouse, *P. sitkensis*. This, though considered a distinct species, is apparently but a robust form of the *maniculatus* group.

So also with the meadow-mice: *Microtus macrurus* is the common form of the southern part of the region. Mainland specimens are much the largest, those from the islands inhabited

by *P. m. hylaeus* are very small, and still farther west we come abruptly to an exceedingly large form, *M. coronarius*. This does not appear to intergrade with *M. macrurus*, just as *P. sitkensis* does not with *P. m. hylaeus*, but nevertheless in each case they seem to be merely gigantic insular races.

The mammals of general distribution are surprisingly few in number. The otter (*Lutra*) ranges, apparently unchanged, throughout the region, and it is easy to see why it should. Beaver occur on most of the larger islands, but according to Heller (1909, p. 251) those from the more southern islands are a different form from the northern ones. Deer also are found throughout the archipelago; but I am strongly of the impression that the deer found south of Frederick Sound will prove to be distinct from the more northern *O. c. sitkensis*. A species of shrew (*Sorex obscurus*) is found apparently on every island and all along the mainland coast, and there is surprisingly little variation in the series from different points. Those from the northern islands, however, appear to be referable to *S. o. glacialis*, from the southern to *S. o. longicauda*.

The land birds of the Sitkan district are for the most part the same as, or closely related to, species ranging along the mainland coast farther south. The equable and comparatively warm climate of this region, compared with the interior at the same latitude, is apparently responsible for this, permitting along the coast the northern extension of the ranges of species whose centers of distribution lie much farther south. Such species as *Cyanocitta stelleri*, *Colaptes cafer saturatior*, *Sphyrapicus varius ruber*, and *Empidonax difficilis*, some of the commonest and most characteristic birds of the Sitkan district, are examples of birds whose ranges extend much farther north along the coast than in the interior. Many species find their northern limit in this region, while a few extend somewhat farther north and west along the Alaskan coast. Almost none of the birds of this region, however, are also found in the cold, dry interior. The exceptions are mostly species of northern derivation, occurring here in the Alpine-Arctic Zone of the mountain tops, the ptarmigan (which has undergone some change, however) and the titlark being good examples of this class.

Still another group is composed of a few species, which, finding their northern limit at about this latitude in the interior, have apparently followed one or two of the broad river valleys to the coast. Examples of these, already treated in detail, are *Geothlypis trichas occidentalis*, *Empidonax trailli alnorum*, and possibly *Piranga ludoviciana*.

Judging from our experience the islands of the Sitkan district do not lie in the main migration route of the birds of the Pacific coast. This is true of the western part of the archipelago to a striking degree. During April and May, and in the first week in June, when the migration should have been in full force, we were visiting the western islands, and, though in some places we found vast numbers of waders and many ducks and geese, the smaller land birds were almost entirely absent. In one or two places, noticeably on Coronation and Warren islands, small flocks of migrating warblers or sparrows were met with from time to time; but we visited numerous other points where it was quite possible to spend several hours in the woods without seeing a single small bird; and when the stillness was broken it was more apt to be by a chickadee or junco than by any transient. I found the west coast of Dall Island to be unusually barren of bird life.

Possibly the migrants travel more along the inner, sheltered islands. On the east coast of Mitkof Island, in August, there was a steady stream of migrating warblers, kinglets, and other small birds following the shore line southward. At Thomas Bay on the mainland, also in August, migrants were much in evidence.

The numerous water fowl of the Sitkan district are for the most part species of wide distribution. The sea birds are, with one or two exceptions, of quite general distribution in the North Pacific; the fresh water species are numerous during the migrations, but comparatively few seem to find congenial breeding grounds in this region. They also are mostly of general distribution in North America. There are two exceptions, however, a goose (*Branta canadensis occidentalis*) and a heron (*Ardea herodias fannini*), which are restricted to the northwestern coast region.

Museum of Vertebrate Zoology, University of California,
Berkeley, June 8, 1910.

LITERATURE CITED.

Allen, J. A.

1903. Mammals collected in Alaska and Northwestern British Columbia by the Andrew J. Stone Expedition of 1902. Bull. Am. Mus. Nat. Hist., v. 19, pp. 521-567.

1910. The black bear of Labrador. Bull. Am. Mus. Nat. Hist., v. 28, pp. 1-6.

Bishop, L. B.

1900. Results of a biological reconnaissance of the Yukon River Region. Annotated list of birds. North American Fauna, no. 19, pp. 47-96.

1900. Descriptions of three new birds from Alaska. Auk, v. 17, pp. 113-120.

Coues, E.

1903. Key to North American Birds. Fifth edition, v. 1, pp. i-xli, 1-535; v. 2, pp. i-vi, 537-1152.

Dwight, J., Jr.

1900. The moult of the North American *Tetraonidae* (quails, partridges and grouse). Auk, v. 17, pp. 34-51, 143-166, pls. IV, V.

1901. The sequence of moults and plumages of the *Laridae* (gulls and terns). Auk. v. 18, pp. 49-63.

Grinnell, J.

1898. Summer birds of Sitka, Alaska. Auk, v. 15, pp. 122-131.

1909. Birds and mammals of the 1907 Alexander Expedition to Southeastern Alaska. The birds. Univ. Calif. Publ. Zool., v. 5, pp. 181-224.

1910. Birds of the 1908 Alexander Alaska Expedition, with a note on the avifaunal relationships of the Prince William Sound District. Univ. Calif. Publ. Zool., v. 5, pp. 361-428, pls. 32-34.

Heller, E.

1909. Birds and mammals of the 1907 Alexander Expedition to Southeastern Alaska. The mammals. Univ. Calif. Publ. Zool., v. 5, pp. 245-264, pl. 26.

Howe, R. H., Jr.

1901. A study of the genus *Macrorhamphus*. Auk, v. 18, pp. 157-162.

Osgood, W. H.

1900. Results of a biological reconnaissance of the Yukon River Region. General account of the region and annotated list of mammals. North American Fauna, no. 19, pp. 1-45, pls. I-VII.

1901. Natural history of the Queen Charlotte Islands, British Columbia. North American Fauna, no. 21, pp. 1-50, pls. I-V.

1905. In Alaska's rain belt. Condor, v. 7, pp. 68-71.

1909. Revision of the mice of the American Genus *Peromyscus*. North American Fauna, no. 28, pp. 1-285, pls. I-VIII.

1909. A peculiar bear from Alaska. Field Mus. Nat. Hist., Publ. 138, Zool. Ser., v. 10, pp. 1-3, pl. 1.

Ridgway, R.

1880 On *Macrorhamphus griseus* (Gmel.) and *M. scolopaceus* (Say). Bull. Nutt. Orn. Club, v. 5, pp. 157-160.

1901. The birds of North and Middle America. U. S. Nat. Mus. Bull., no. 50, part 1, pp. I-XXX, 1-715, pls. I-XX.

1904. Ibid. Part III, pp. I-XX, 1-801, pls. I-XIX.

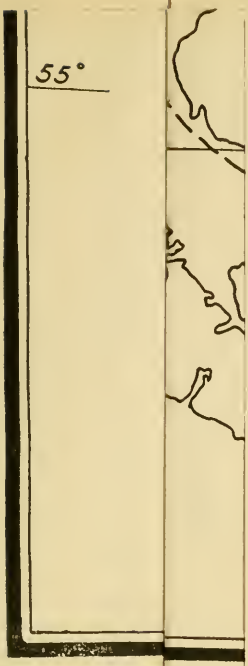
Stejneger, L.

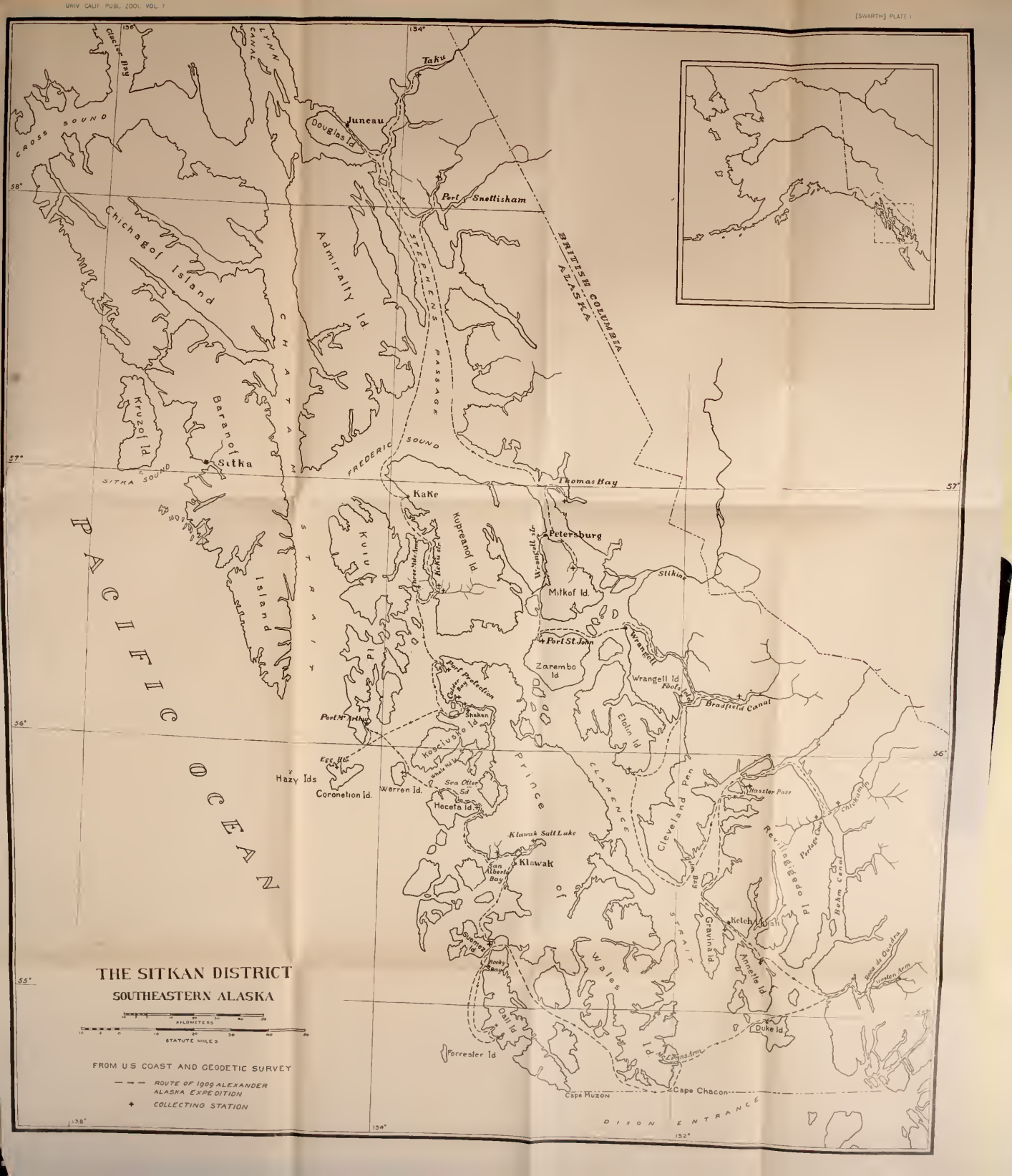
1885. Results of ornithological explorations in the Commander Islands and in Kamtschatka. U. S. Nat. Mus. Bull., no. 29, pp. 1-382, pls. I-VIII.

EXPLANATIONS OF PLATES.

PLATE 1.

Map of the region traversed by the 1909 Alexander Alaska Expedition. Dotted line shows route of the Expedition; crosses indicate collecting stations.


55°



THE SITKAN DISTRICT

SOUTHEASTERN ALASKA

KILOMETERS 10 0 10 20 30 40 50

STATUTE MILES 10 0 10 20 30 40

FROM U.S. COAST AND GEODETIC SURVEY

— — — ROUTE OF 1909 ALEXANDER ALASKA EXPEDITION

\+ COLLECTING STATION

PLATE 2.

Woods and meadows at Portage Cove, Revillagigedo Island; July 3, 1909. This is typical of the region visited in southeastern Alaska. (See page 20.)

PLATE 3.

Antlers of black-tail deer (*Odocoileus columbianus sitkensis*) from southeastern Alaska. Those on the right from Chichagof Island, on the left from islands south of Frederick Sound. Note the difference in the forking; in the series on the left the branching tines are conspicuously forked, while in those on the right they are straight.

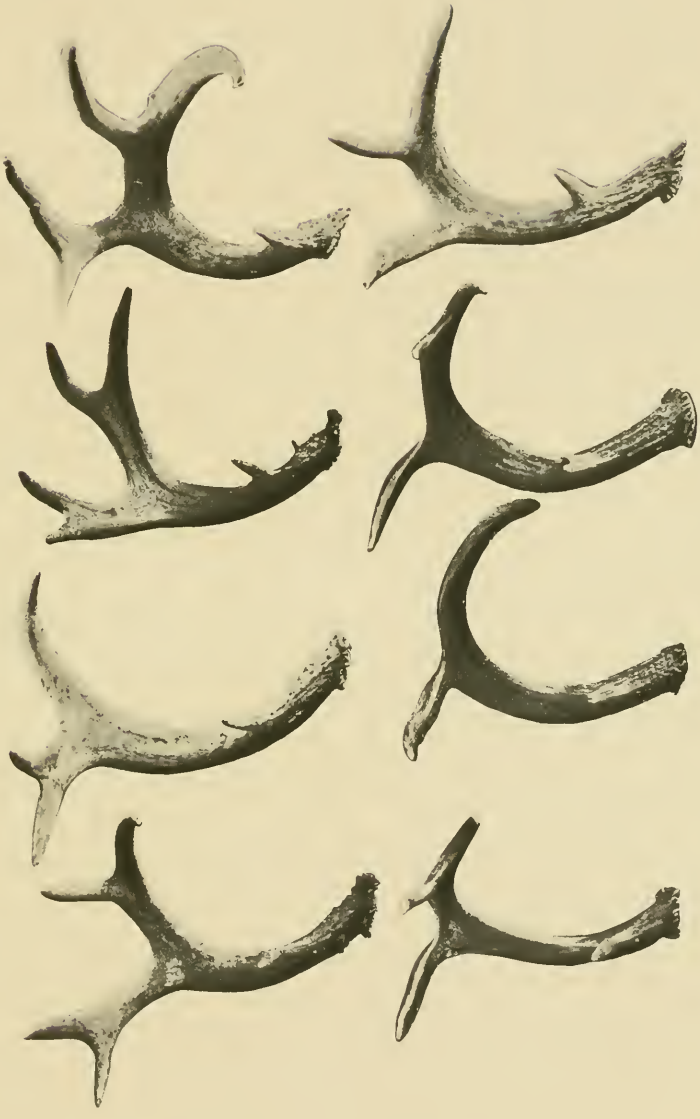


PLATE 4.

Fig. 1.—Banks inhabited by muskrats (*Fiber z. spatulatus*) at Portage Cove, Revillagigedo Island; July 3, 1909. The burrows were excavated in the walls of the gulches, the entrances being covered at high tide. A pile of cut food is at the mouth of one of the burrows shown.

Fig. 2.—Hoary Marmot (*Marmota caligata*) at entrance to burrow; Port Snettisham, August 25, 1909.

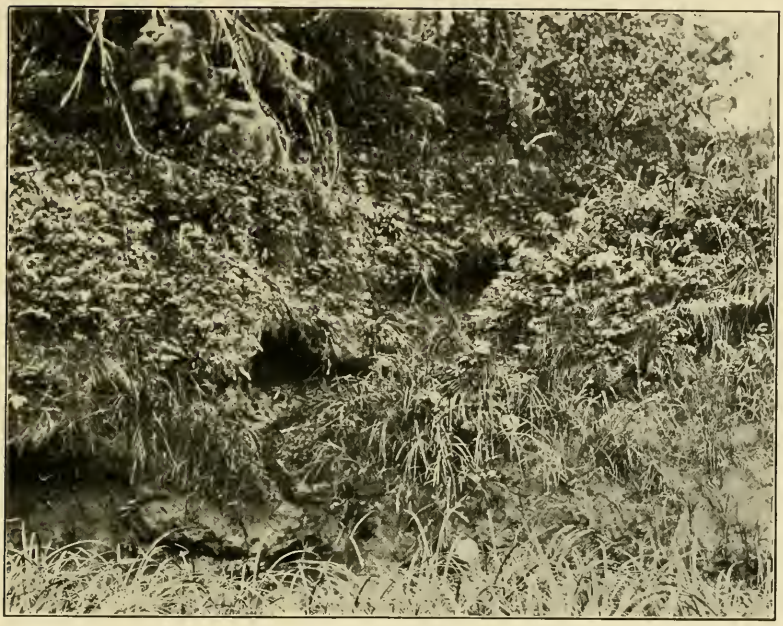


Fig. 1.

Fig. 2.

PLATE 5.

Dorsal view of skulls of *Microtus coronarius* (series on the left) and *Microtus macrurus* (series on the right). Enlarged to 1⅙ natural size. The former are uniformly larger, there being no differences in shape or proportions.

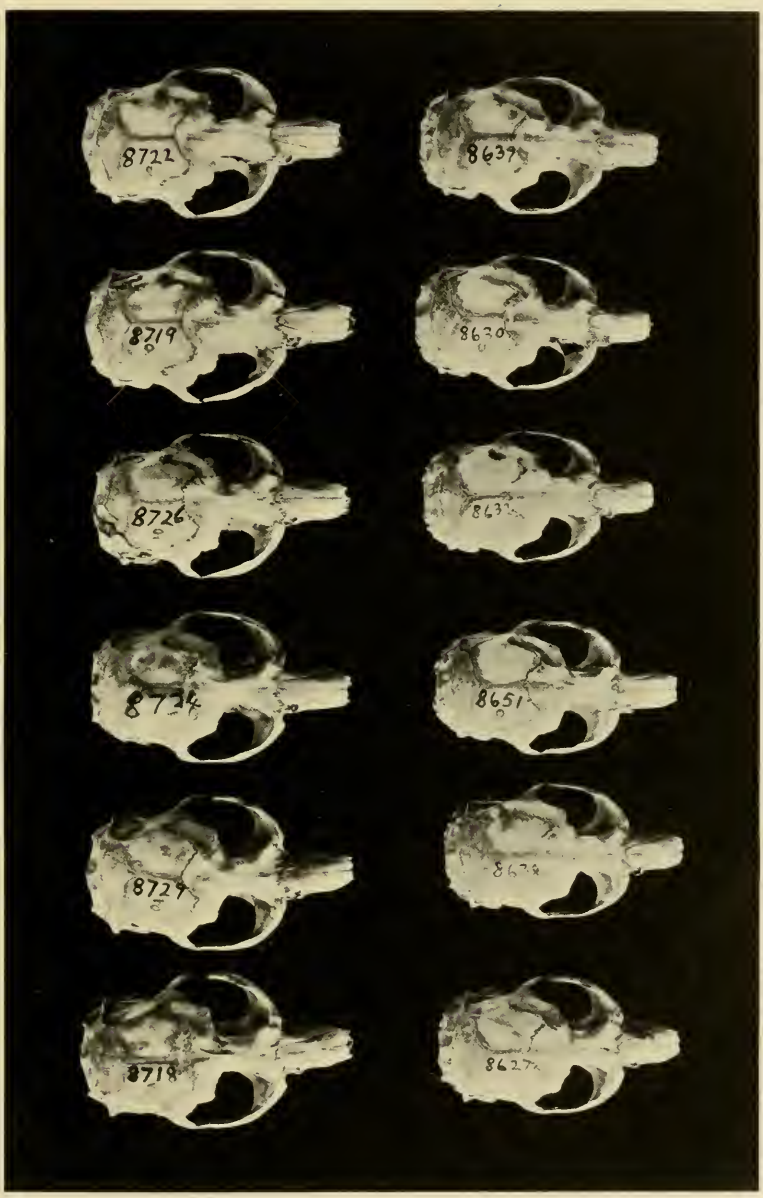

8722
8637
8719
8630
8726
8634
8724
8651
8727
8628
8718
8627

PLATE. 6.

Fig. 1.—Lateral view of skull of type of *Ursus americanus pugnax*. Reduced to $\frac{1}{3}$ natural size. Note the depressed frontals, prominent post-orbital processes, largely developed sagittal crest and general appearance of massiveness.

Fig. 2.—Dorsal view of skull of type of *Ursus americanus pugnax*. Reduced to $\frac{1}{3}$ natural size. Note the conspicuous sagittal crest and temporal ridges, and the heavily built and wide-spreading zygomata.

Fig. 1.

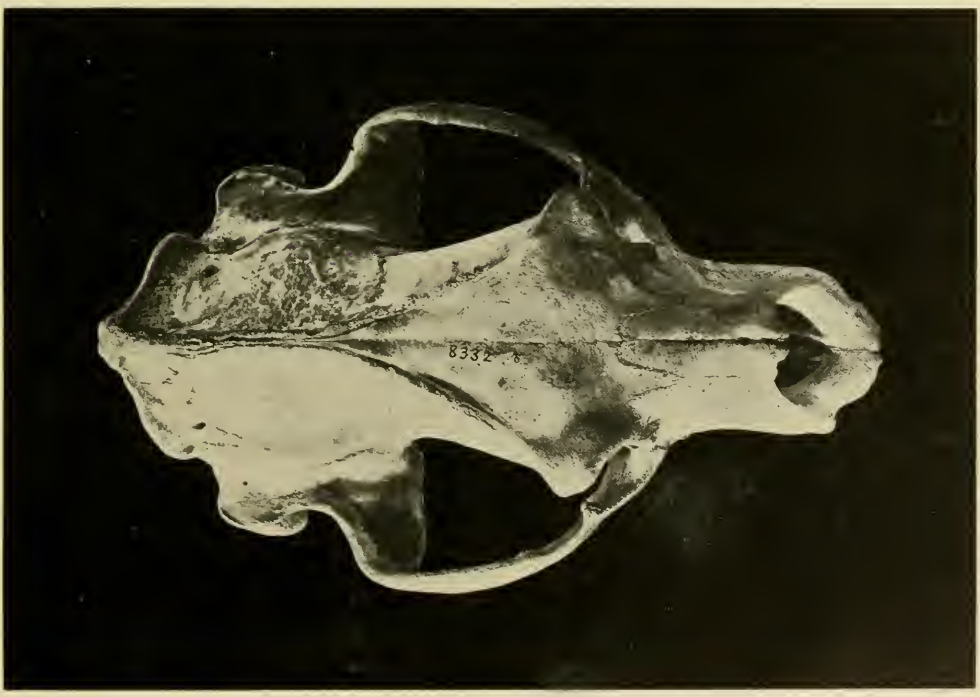


Fig. 2.

Vol. 3.
1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
   Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
   Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
    Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
    Index, pp. 369-383.

Vol. 4.
1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
   Nos. 6 and 7 in one cover. April, 1908 ..... .50
   Index, pp. 395-400.

Vol. 5.
1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
   Nos. 6 and 7 in one cover. February, 1910 ..... .20

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.
9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.
10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15
11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.
12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10
2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20
3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30
4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50
5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10
6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50
7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35
8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10
9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15
10. (XXX) Biological Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.
11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20
12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60
13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10
2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

MEMOIRS OF THE UNIVERSITY OF CALIFORNIA (Quarto).

Vol. 1. No. 1. Triassic Ichthyosauria, with special reference to the American Forms. By John C. Merriam. Pages 1-196, plates 1-18, 154 text figures. September, 1908 ..... $3.00

Vol. 2. The Silva of California, by Willis Linn Jepson. 480 pages, 85 plates, 3 maps. December, 1910 ..... 9.00

Other series in Classical Philology, Economics, Education, Egyptian Archaeology, Engineering, Entomology, Graeco-Roman Archaeology, Mathematics, Psychology, Semitic Philology, Modern Philology.

UNIVERSITY OF CALIFORNIA CHRONICLE.—An official record of University life, issued quarterly, edited by a committee of the faculty. Price, $1.00 per year. Current volume No. XIII.

Address all orders, or requests for information concerning the above publications to The University Press, Berkeley, California.

European agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, and Semitic Philology, Otto Harrassowitz, Leipzig. For the Memoirs, and the series in Botany, Geology, Pathology, Physiology, Zoology and also American Archaeology and Ethnology, R. Friedlander & Sohn, Berlin.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 3, pp. 173-177 February 18, 1911

AN APPARENT HYBRID IN THE GENUS *DENDROICA*

BY

WALTER P. TAYLOR

Smithsonian
FEB 25
National Museum

BERKELEY
THE UNIVERSITY PRESS

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN
BERLIN

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25
Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)
Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25
1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.
Nos. 1 and 2 in one cover ..... .60
3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.
Nos. 6 and 7 in one cover ..... .25
8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25
Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 3, pp. 173-177 February 18, 1911

AN APPARENT HYBRID IN THE GENUS *DENDROICA*

BY

WALTER P. TAYLOR

(Contribution from the Museum of Vertebrate Zoology of the University of California)

Among the birds collected by the Museum expedition to northern Humboldt County, Nevada, during the summer season of 1909, are a number of examples of the genus *Dendroica*, most of which are clearly referable to *Dendroica auduboni* (Townsend). However, one adult female (no. 8685) is definitely the Myrtle Warbler, *Dendroica coronata* (Linnaeus). A third specimen is peculiar in that it presents an almost perfect combination or blending of the characters of the two, *auduboni* and *coronata*. This is an adult male specimen (no. 8687), taken at Quinn River Crossing, Humboldt County, May 29, 1909, by Mr. Charles H. Richardson, Jr. This furnishes the first instance known to the writer of hybridization within the genus *Dendroica*.

Comparison of this specimen with typical adult males in the same plumage (the adult nuptial; see Dwight, 1899, p. 217), may profitably be made. Such examples are no. 6012, taken in Massachusetts on May 25, representing *D. coronata*, and no. 8682, taken in northern Humboldt County, Nevada, on May 17, exemplifying *D. auduboni*. The three specimens are all in nearly the same stage of plumage wear. The plumage of no. 6012 is not quite so much worn as that of the other examples. The adult nuptial plumage in these cases results from a complete spring molt of body plumage.

The hybrid is slightly nearer *coronata* than to *auduboni*. The streaking of the back is apparently the same in amount. The yellow of the crown is of a slightly lighter shade than in either *coronata* or *auduboni*, and its area is about the same, though it is not so "concealed" as in *coronata*. The patch of yellow on the rump is much the same as in either species, although it is of a slightly lighter shade. Wings present a condition clearly intermediate. In the hybrid the greater wing coverts are not so broadly tipped with white as in *coronata*. They differ from *coronata*, however, in being broadly edged with white (no. 6012 has greater coverts very narrowly edged with grayish brown). The middle coverts are on the average more broadly tipped with white in the hybrid than in *coronata*, and are edged with white. Some allowance must be made for the fact that the hybrid is in plumage which is a little more worn than that of no. 6012. This means that in the exactly comparable stage, the tippings and edgings would probably be very definitely broader, and more extensive than in *coronata*. At any rate it is apparent that the intermediate is in this respect nearer *coronata*. The tail in no. 8687 is black, edged with bluish-gray as in *auduboni*. The white areas on the inner vanes of the rectrices are less in extent than in either 6012 or 8682. They decrease in size from the outermost rectrix to the third, and are practically lacking on the fourth. There is a faint indication of white on the inner vane of the fourth rectrix on the left side. In this respect the bird is not intermediate, but is like *coronata*. A small white patch is apparent above the auricular region. This is all that remains of the supra-auricular streak of *coronata*. The bird has also a spot of white on the upper and on the lower eyelid, like *auduboni*. Thus in the reduction of the supra-auricular stripe the intermediate character of the bird is again shown.

Suborbital and auricular regions are almost exactly intermediate in color between *coronata* and *auduboni*, being very much blacker than the latter, but having nevertheless a distinct blue-gray tinge. Loral region distinctly black, like *coronata*.

The coloration of the malar region, chin and throat also, is

midway between that of *coronata* and *auduboni*. These parts are white, modified on the throat and malar region by a slight wash of yellow. The shade is not nearly so deep as the yellow of *auduboni*. The extent of this slight throat marking is between that in *auduboni* and *coronata*. In the former the yellow area does not widen posteriorly, while in the latter there is a flaring of the white area as the upper breast area is approached, and the white area runs up a little on the posterior side of the auricular region. In the supposed hybrid the white-yellow area flares posteriorly as in *coronata*, but not to so great an extent.

If any true intermediate condition exists in the chest region, it is obscured by the fact that no. 6012, representing *coronata*, is not quite so much worn as no. 8687, the specimen in question, which is slightly less worn than no. 8682, representing *auduboni*. So that, from consideration of plumage, the white areas on the chest feathers of the hybrid would find themselves in a condition between those of the two species.

The yellow on the sides of the breast is like *coronata* in shade, being a trifle lighter than in *auduboni*.

The most obvious and important characters which immediately fix the bird as an intermediate are those of the coloration of the sides of the head and of the chin, throat, and malar region. In matter of tail markings it is nearest *coronata*.

DISCUSSION

According to Ridgway (1902, p. 548), the breeding range of *Dendroica coronata* is North America in general, chiefly east and north of the Rocky Mountains; from the mountains of western Massachusetts, northeastern New York, northern Michigan, and Manitoba, to the limit of tree growth (Labrador to western Alaska). That of *Dendroica auduboni* is given by the same author (*loc. cit.*, p. 553) as being North America, north to British Columbia, east to western border of the Great Plains, breeding southward (in coniferous woods on high mountains) to southern California, etc. Although definite records from middle or northern British Columbia or some other of the western provinces of Canada appear to be wanting, it is probable that the breeding

ranges of *auduboni* and *coronata* adjoin somewhere in that general region. From a consideration of breeding ranges, hybrids between the two might be expected. While presumably distinct and well characterized species, *coronata* and *auduboni* are by no means distantly related, and there seems to be no logical reason why the two should not cross occasionally.

Nor are hybrids unknown within the Mniotiltidae. *Helminthophila lawrencei* (Herrick) (see Ridgway, 1902, p. 452) is a species described from probable hybrids between *H. chrysoptera* (Linnaeus) and *H. pinus* (Linnaeus); and of another species closely related to *lawrencei*, namely *Helminthophila leucobronchialis* (Brewster), Ridgway remarks (*loc. cit.*, p. 453) that as in *lawrencei*, certain of the characters of *chrysoptera* are combined with certain others of *pinus*. It is said that there is every probability that the four species, *lawrencei*, *chrysoptera*, *pinus*, and *leucobronchialis*, interbreed freely to a large extent and are fertile *inter se*, rendering the problem a very complicated one, since dichromatism also may enter into it. A third described species of *Helminthophila*, namely *cincinnatiensis* (Langdon), is adjudged by Ridgway (*loc. cit.*, p. 446) to be untenable on the ground that it is clearly a hybrid between *Helminthophila pinus* and *Oporornis formosa*.

As to the possibility of this individual being, not a hybrid, but a mutant in the De Vriesian sense, or a germinal variant as defined by Tower (1906), having sprung from one or the other of the species *auduboni* or *coronata*, it may be said that the hypothesis of hybridization seems to be the one more nearly in accordance with the facts of the case. If there were proved to be a hiatus between the breeding ranges of the two species, the case might be somewhat changed; but it is very probable that the ranges overlap in the region suggested. If the bird *is* a mutant, why should it, having sprung from one species, approach the other in nearly all its characters? If the breeding ranges of the two species do overlap, we might expect to find hybrids more commonly. Evidently, however, crossing is infrequent, and not at all comparable to that of the interbreeding of the flickers (*Colaptes cafer collaris* and *Colaptes auratus luteus*). Scott

(1905, pp. 271-282) suggests that a number of the bird species from the "Hypothetical List" of the American Ornithologists' Union *Checklist of North American Birds*, were probably founded on mutants. Allen (1905, pp. 431-434) criticizes certain weak points in Scott's conclusions. A review of Scott's paper by Allen in the Auk (1906, p. 112) sums up the evidence, which points clearly and definitely, in the cases considered, to hybridization rather than to mutation.

As in those cases, so in the present one of *Dendroica*, the bulk of the evidence indicates the former rather than the latter hypothesis. Still, the possibility of the bird in hand being an example of extreme germinal variation, with parentage in one or the other of the species (*audubon*i and *coronata*), is not to be left altogether out of consideration.

LITERATURE CITED.

Allen, J. A.

1905. The probable origin of certain birds. Science, n.s., vol. 22, pp. 431-434.

1906. Scott "On the probable origin of certain birds." Auk, vol. 23, pp. 112-113.

Dwight, Jonathan, Jr.

1899. Sequence of plumages illustrated by the myrtle warbler (*Dendroica coronata*) and the yellow-breasted chat (*Icteria virens*). Auk, vol. 16, pp. 217-220, pl. 3.

Ridgway, Robert.

1902. The birds of North and Middle America. Bulletin U. S. Nat. Mus., no. 50, part II, pp. i-xx, 1-834, pls. 1-22.

Scott, William E. D.

1905. On the probable origin of certain birds. Science, n.s., vol. 22, pp. 271-282.

Tower, W. L.

1906. An investigation of evolution in Chrysomelid beetles of the genus *Leptinotarsa*. Carnegie Inst. of Wash., Publ. no. 46, 1906, pp. i-x, 1-320, pls. 1-30, text-figs. 1-31.

Transmitted November 28, 1910.

Vol. 3. 1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
Index, pp. 369-383.

Vol. 4. 1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
Nos. 6 and 7 in one cover. April, 1908 ..... .50
Index, pp. 395-400.

Vol. 5. 1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
Nos. 6 and 7 in one cover. February, 1910 ..... .20

* Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.

9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.

10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15

11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.

12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Bioligical Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05

4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15

5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05

6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 4, pp. 179-195 February 18, 1911

THE LINNET OF THE HAWAIIAN ISLANDS: A PROBLEM IN SPECIATION

BY
JOSEPH GRINNELL

BERKELEY
THE UNIVERSITY PRESS

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN
BERLIN

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

   Nos. 1 and 2 in one cover ..... .60
3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

   Nos. 6 and 7 in one cover ..... .25
8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 4, pp. 179-195 February 18, 1911

THE LINNET OF THE HAWAIIAN ISLANDS: A PROBLEM IN SPECIATION

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

At the outset certain facts apropos of the discussion to follow should be stated. In the linnet, at least of California (*Carpodacus frontalis*), the male and female are always differentially marked beginning with the post-juvenal (first fall) molt. After the post-juvenal molt, in both sexes, there is but one annual molt, occurring in August. The female at no period of its lifetime has any trace of bright colors (red, orange or yellow). Neither has the juvenal male up to the time of its post-juvenal molt any trace of bright colors. At its post-juvenal molt the male acquires a first annual plumage not perceptibly different in matter of intensity or extent of color from that assumed at any later or more "adult" period of life. A corollary of the fact last stated is that during the winter and spring—from September until the time of appearance of full-fledged young the following season—there are no male linnets without color. This is very different from the case in *Carpodacus purpureus* and *C. cassini*, where the post-juvenal molt of the male leads into an uncolored first annual plumage, practically identical with the plumage of the normal adult female. The above facts are abundantly indicated by the extensive series of specimens in the California Museum of Vertebrate Zoology.

The colored areas of the male are: broad frontal band, with lateral extensions posteriorly over each eye and auricular patch, to posterior limit of latter; rump; whole chin, throat, malar

region and chest. In "high plumage" the sides of the head and neck, the whole dorsum and top of head, and even the lower breast, belly and crissum, may be pervaded with a tint of those parts always colored. The remainder of the plumage is of the hair-brown and grayish-white pattern displayed on all parts of the female.

In the large series of males of the California linnet, leaving out the rare examples which are distinctly yellow or orange, striking variation is shown in the tint of the red. But arrangement of the component examples by date, from September to July, shows this variation to parallel the lapse of time beyond the fall molt, and to be altogether due to the effects of wear. There is no spring molt; and the notion that an influx of new pigment into the feather towards spring serves to produce the bright colors of the nuptial dress is, of course, without foundation. In the fresh fall plumage the red is of a conspicuous pinkish cast (burnt carmine of Ridgway's *Nomenclature of Colors*, 1886 edition); there is thereafter a gradual change through crimson, until by summer a brilliant poppy red is displayed.

Attention may here be called to the fact that the brilliant hues of the nuptial plumage are thus, in reality, determined in the forming feathers at the post-nuptial (or annual) molt, several weeks *after* the season of mating, instead of immediately preceding. This fall molt period is generally considered (as by bird-fanciers and poultry-raisers) to be the time of the year when the general vitality of the bird is at its lowest ebb. Moreover, the organs of reproduction at this time are reduced in size and in the sexual function to a quiescent condition. It would seem, therefore, that the production of the brilliant nuptial plumage is *not* in the linnet coincident with a period of excessive sexual vigor, as some applications of a current theory seem to demand. (See Cunningham, *Sexual Dimorphism in the Animal Kingdom*, 1900, pp. 36-44.) It is, however, clearly anticipatory; and here we find manifestation of a most delicate structural complex, so adjusted, as pointed out in the next succeeding paragraphs, as to bring about through purely extrinsic, physical agencies, a "nuptial" brightening of dress at the season of courting, seven to nine months later.

In an old male in the midst of the annual molt (for instance, no. 14566, taken August 9) we find presented side by side, very brilliant but old and worn feathers, along side of dull carmine, but new and unabraded feathers.

Microscopical examination of various appropriate feathers shows the following conditions. In the newly-acquired, unworn feather, the red pigment is restricted to the barbs of the contour portion of each feather, except for their terminal portions to a distance of one millimeter from their tips. These barb-ends, which together thus constitute a grayish band terminating each feather, and all the barbules, are white. In the extremely old abraded (summer) feather these uncolored end-portions of the barbs in the overlapping feathers, and all of the barbules, have simply been broken off and lost, thus removing the grayish obscuration from the bright red in the barbs. The intrinsic color of these has not changed one whit in tone or tint. For a discussion of similar processes in other birds, see Dwight (1900, pp. 73-360).

One is again led to remark upon the difference in structure between the pigmented and unpigmented portions of the feather, the former being by far the most resistant, the latter being so adjusted in extent, location and texture as to become completely disintegrated and lost at the end of the winter season and at the advent of the season of mating.

As above explained, the apparent great range of variation in color in a normal series is largely dependent on season, and is due to wear; and when in each case this factor is given due weight, it is found that the crimson type of coloration in the California linnet is really quite constant. However, throughout its range there occur, though in most regions rarely, individuals of totally different appearance.

Taking all available skins into consideration, it appears that the colored parts of male linnets, always taking the wear factor into account, fall into the following color categories: pure red (crimson); pure yellow (chrome); orange (which is a blend of these two colors); mixed (crimson feathers with yellow or orange feathers scattered among them).

The 307 males examined and tabulated (Table I), are from

the Museum of Vertebrate Zoology, and the Mailliard, Morcom, Swarth and Grinnell collections. An element of error must be taken into account in tabulating specimens in private and museum collections as to category of coloration. With the ordinary collector in the field who scrutinizes the birds he shoots, any bird presenting a peculiar appearance is selected for preservation. And, further, where specimens from collections are disposed of by exchange or sale, it is, in my experience, the oddities that are reserved for the owner's series. Hence it appears probable that the real percentages of aberrantly colored linnets to the normal type in California is much less than that indicated in the table presented herewith.

In the late winter of 1910 a series of twenty-three linnets was collected in the Hawaiian Islands by Miss Annie M. Alexander, and was shortly afterwards presented by her to the California Museum of Vertebrate Zoology. These specimens were collected indiscriminately, with no realized intention of selecting oddities. Thirteen of the specimens are of male birds, and these, as soon as compared in the Museum, at once incited inquiry because of their peculiar colors, not at all like those characterizing the usual California linnet.

The Hawaiian examples in question are listed herewith in a table (II) arranged to show locality, date and color peculiarities of each individual. In the other table (I) the color categories into which the Hawaiian birds fall, are presented proportionally, along with those of 294 male linnets from different faunal areas in the western United States.

It is a conspicuous fact that in the California series the tints (red, orange and yellow) are, considering stage of plumage wear, each uniform, while in the Hawaiian series the tints (orange, yellow) are somewhat variable. But all the Hawaiian birds are off color. No two of the latter are precisely alike, there being subtle and indescribable differences between any two. This cannot be due to the effects of wear, either, as all the specimens were taken within two months of one another, and toward the beginning of the nuptial period.

It is further observable that in the yellow and orange types the colored areas are least extensive; and in the reddest birds of

the United States series—those of "highest" plumage—the color is most extended, often pervading nearly the entire body plumage. In two of the Hawaiian birds, as stated in Table I, which are of the orange type, there is an admixture of yellow feathers, and in one of these, carmine feathers also.

As to the history of the linnet in the Hawaiian Islands, I have been able to gather the following data: Bryan (1901, p. 39) states: "Hawaiian Islands; introduced." Henshaw (1902, p. 129) says: "This pretty finch is probably established on all the islands. Upon certain parts of the islands of Hawaii and Maui it is exceedingly numerous and is increasing all the time." In their publications both Bryan (1901, p. 38) and Henshaw (1902, p. 129) describe the colored parts of adult males as being *crimson*, without further remarks. McGregor (1902, p. 60) records that of five males secured on Maui "but one was in the red plumage, the others having orange and yellow."

As being above all others the person most likely to have information along this line, I addressed Mr. H. W. Henshaw, now Chief of the Bureau of Biological Survey, Washington, D. C. He wrote me under date of July 5, 1910, as follows: "While I was in Honolulu I tried without success to ascertain somewhere near the exact year in which these birds were liberated in one or more of the Islands. It is possible that among the old inhabitants there is someone who can give the desired information, but I do not know to whom to refer you for it. I think there can be no doubt that they were obtained from San Francisco or nearby, but of this I have no definite proof. I shot a number of the species in the Olaa woods, usually by mistake for other species. All the males I obtained had yellow heads instead of crimson, but remembering that even in California the yellow-colored birds are not rare, I did no more than wonder if the species was undergoing a change of color in the very rainy climate of the Olaa district. If you find that birds from Oahu also are yellow I should think you have hit upon a very interesting case of change of color owing to change of environment, and one worth looking into."

In response to inquiry, Mr. W. A. Bryan wrote me under date of July 22, 1910, that he was unable to give any informa-

tion as to date or source of introduction of the house-finch into the Hawaiian Islands. He further stated: "While connected with the Bishop Museum I collected a number of specimens at various seasons of the year and under different conditions, and found the color to which you refer to vary widely among individuals. * * * While I have written nothing on the subject, my impressions and observations lead me to the belief that the variation in color between crimson and yellow is individual and seasonal rather than environmental."

Under date of November 1, 1910, Mr. Loye Holmes Miller writes me as follows: "I saw linnets on three of the Islands, namely Oahu, Hawaii and Kaui, in the spring of 1903. My impression was that the birds were less brightly colored as a rule than those of the California coast. On the islands of Hawaii and Oahu I do not recall seeing the yellow phase at all. On the island of Kaui, however, several were seen in the course of a week's stay. It may serve as some indication as to the proportion in which the yellow birds occurred to state that on my starting out to obtain actual specimens of the yellow-plumaged phase, none were encountered during an afternoon's hunt, though the ordinary (red) form was not uncommon."

The above data indicate that eight to ten years ago there were many red or crimson linnets on the Hawaiian Islands, and that off-color birds were present also, but in smaller proportion. The species was then already widely distributed. I regret exceedingly not being able to obtain for examination any specimens collected at that time. The evidence given above is the only available basis of judgment.

While the opinion is everywhere held that the linnets of Hawaii were introduced from California, I have been unable to get satisfactory historical data. From three sources—old residents of Honolulu—I am assured that there were linnets there at least as long ago as 1870. But the parties in question were confessedly not particularly observant of birds.

It is supposed that the linnets originally introduced into the Hawaiian Islands were procured from the vicinity of San Francisco. Comparison of the series of Hawaiian birds at hand, both males and females, with a series from the San Francisco Bay

region supports this belief; for they show no apparent differences in length of wing, in length of tail, in size or turgidity of bill, or in intensity or extent of hair-brown streaking in either sex. The only difference is in the color of those parts in the males which *are* colored. There is no perceptible increase or decrease in the deposit of dark pigment in the females.

It would appear that the hair-brown pigment and the red-orange-yellow pigment are of different orders as regards modificational behavior. The latter does not appear to show at all any response to humidity or to light-intensity, as does the dull, brown-gray-ocher category of colors, which are subject to such enormous range of shade and tint in a multitude of bird species under varying climatic conditions.

Of eighteen males of *C. frontalis* taken on the deserts bordering the lower Colorado River, in Arizona and California, about the most arid region of North America, February 22 to April 30, and therefore comparable in stage of wear with the Hawaiian series, all but two are of the crimson color type, and uniform, accounting for results of greater wear in the latest spring examples. The characteristic color is dull crimson tending toward burnt carmine, this spreading over the whole dorsum and sides of head. Wear brightens this toward poppy red. Of the two aberrant examples in this lot, one is quite uniform orange-vermilion (and thus nearly a duplicate of the deepest orange of the Hawaiian birds, no. 12602); the other is dingy chrome yellow, not exactly like any of the Hawaiian examples, but of the same general category as nos. 12598 and 12613. There are no birds of mixed colors in this lot. Thus 11 per cent. of this lot of desert linnets are "off color," and 6 per cent. each are of the distinctly yellow type and the orange-red type.

According to McGregor (1901, p. 13), linnets from certain islands off the west coast of Lower California are notably subject to this color variation. "Among the finches from the San Benito Islands (*C. megregori*), I have never seen two alike. The colors range from bright crimson through orange into lemon yellow, with all manner of variations resulting from combinations of these colors and their shades and tints. It is impossible to take any example and say it is the typical coloration.

"The finch of Guadalupe Island (*C. amplus*) shows more stability in its coloration, but even here we often find birds varying from the normal. Of seventeen males before me, nine, or over one-half, are more or less yellow. In two of these the rump, head, and breast are clear lemon yellow, in a third the feathers are about equally red and yellow, of a pale washed-out look. The remaining six have a few yellow feathers irregularly mixed with the crimson. The proportion of yellow birds which really occurs is probably less than the above figures would indicate, as this series was selected somewhat with a view to getting the abnormal examples."

Although peculiarities in coloration are used as diagnostic characters of the above two insular forms (Ridgway, 1901, pp. 141, 142), there are also in each case structural features (proportions of bill, etc.) which alone differentiate them from each other and from the mainland form.

The climate of the San Benito Islands is, according to published accounts, hot and arid, that of Guadalupe Island, fairly cool and semi-humid.

It would seem from what is shown by Table II, as well as from the additional data given immediately above, that neither humidity or temperature, nor both (that is, *climate*) can be called into account as an actuating cause of the appearance of the yellow "sports." It is of interest to note that of the native passerine birds of the Hawaiian Islands, which are brightly colored, seven are brilliantly red, and some twenty-one are more or less yellow or orange. These are all quite surely themselves of exotic origin, though so remotely that their affinities are not clearly apparent. According to Gadow (*fide* Knowlton, 1909, p. 809) the Drepanidae, to which family most of the brightly-colored Hawaiian birds belong, are probably derived from the American family Coerebidae (honey creepers). The representatives of the latter family many of them have much yellow in the plumage; but none of them are red.

Among various species and families of birds in North America climate has no evident effect on the predominance of these colors. Both red species and yellow species occur in humid and arid, hot and cold, regions. There are, however, most of both in warm, humid regions.

As is very well known, California linnets, when placed in confinement and originally red, become yellow with successive molts *during the life of the individual*. I am informed by two dealers in caged birds that adult male linnets (of the normal plumage) when trapped and kept in confinement remain red for two years, when abruptly, at the time of molt, they become dull yellow (with no intervening orange stage). When sold for plumage, it is thus desirable from the dealer's standpoint that their linnets be sold out before the inevitable de-coloration.

Mr. Loye Holmes Miller contributes the following suggestions to the present discussion: "The Mexicans of Arizona and Lower California are especially fond of keeping the species in captivity, and almost invariably the effect is to turn the plumage yellow. One individual whose history I obtained made the change from red to yellow at the age of three years. Reared in captivity, it assumed the red phase first, then during its fourth year changed to the yellow phase. Is it not barely possible that the Hawaiian-born birds, affected in some similar way by the changed environment, assume the yellow plumage at a more or less advanced age? The longevity of the individual would in this way influence the ratio of yellow to red forms. The absence of birds of prey in the Islands might again conduce to greater longevity; so that the introduction of the factor of senility might further complicate the problem."

It would seem, however, from the fact that *all* the male linnets obtained or seen in the Hawaiian Islands in 1910 are off-color, that age alone in the individual could have little to do with this condition of affairs, at least at the present time. It would be extremely improbable that no birds-of-the-year should be encountered among so many individuals, when ordinarily, among passerine birds in the winter, birds-of-the-year are in the majority.

While results seem to have been brought about through a series of generations of the Hawaiian birds similar to those occurring within the lifetime of a caged linnet, it does not necessarily follow that the same initial cause or successive processes were or are operative in the two cases. Still, this is a reasonable inference. Experimentation on linnets in confinement, in which

various factors have been eliminated by control, might, in connection with ecological field studies, go far towards determining whether or not the causes and processes are the same in the two cases.

The three color types occur more purely in the linnets of California. In the Hawaiian series, taking into account the effects of wear in the individual feathers, the two color types present are each much more variable. It would seem that, as Tower (1906, p. 285) found with certain potato beetles, sudden change into a new environment is followed by an increase in the range of variation.

As to the nature of the variations in the linnets, whether or not inheritable, there is nothing known. At any rate in the development of the Hawaiian type of linnet, it would seem that there could be no chance for the action of any sort of selection (sexual, natural, or artificial). The characters do not, by any stretch of the imagination, appear to be of adaptive value. Tower found in the case of potato beetles, that the same kind of characters may be somatic, acquired during the post germinal period, or germinal, inherited. It is possible that in the Hawaiian linnet the yellowness is heritable, even though the same feature arising in caged birds be obviously somatic.

It has been supposed that change from red to yellow in caged birds is in some way caused by change in food, or by general deterioration in bodily vigor, or perhaps due to a lack of a normal amount of muscular activity. The latter would, according to this idea, reduce the amount of the products of metabolism. Some dermal pigments have been described as modified excretory products.

Yellow, orange and red pigments are said to be in certain animals the same basally—manifestations respectively of lesser or greater degree of oxidation of a chromogen in the presence of an enzyme. (See Riddle, 1909, p. 320.) I have, however, been unable to find out anything appropriate in regard to the chemico-physiological basis of these colors in birds.

That food can be the prime cause of the color-modification in the linnet is possible; but the following facts do not give this explanation more than a remote probability. The crimson linnet

is almost if not quite exclusively a feeder upon *vegetable* materials (seeds and fruits). In its wide range over the North American continent, in most parts of which it is non-migratory, it inhabits very many diverse floral areas productive of foods of great variety. As far as the data go (Table I) the occasional yellow sports do not occur with preponderating frequency in any one floral area. If this is the case over the continent, it is hardly to be expected that there could be any food of extraordinary qualities occurring in quantity in the several separate island habitats, and there alone, that would have brought about the same peculiarities of color.

The theory has been advanced (Keeler, 1893, p. 154) that in the evolution of color phylogenetically yellow is a primitive one, and that red is a later development. A fact in support of this idea is the ontogenetic condition frequent among birds, where the young are yellow, the adult males, at least, red. This is quite in harmony with the color formation theory of Riddle. But that the occurrence of occasional yellow examples among the linnets of California may be considered reversionary, is not so apparent. In the case of the linnet, the young are without any bright colors at all. The first color to appear in the lifetime of the individual of the California linnet is, normally, red.

We find that linnets introduced on the Hawaiian Islands, where they have perfect freedom, abundant food-supply, and such all-round favorable environs that they have multiplied and spread prodigiously within a relatively short time, have acquired color characters similar to birds in confinement. If deterioration in vigor contributes to the decoloration of the latter, it does not appear clear how the same cause could be held to have accounted for the former. Even if the linnets introduced on the Islands are actually subject to much more favorable conditions (lack of enemies, more abundant food-supply, etc.), it is not clear to me how this new environmental condition would necessarily result in *deterioration* in physical vigor. It would appear from a survey of distributional behavior in appropriate cases among North American birds, that where one or more adverse factors are withdrawn the species reacts simultaneously by increase in numbers until some other check or checks become

operative to an extent to establish a limit of population. There is nothing to indicate that removal of adverse influences results in weakening the vigor of the species.

Of course, general decadence of a genus whether or not obviously overspecialized, is an entirely different proposition. But this does not appear to be at all probable in the case of *Carpodacus*, a genus of very wide geographical range, through greatly varying conditions.

The fact that the off-color character appears to be most prevalent on *islands* (as those off Lower California as well as the Hawaiian) is to me of greatest significance. Close breeding is known to be in some cases accompanied by various abnormal manifestations. The assumption of the orange or yellow dress in the insular linnets may, after all, be at bottom, of intrinsic or germinal origin.

This is emphasized by the conspicuous way in which the color-manifestations of the Hawaiian linnet are in direct harmony with the tyrosin-oxidation idea, as expressed by Riddle. In order that this chemical operation may proceed, the presence of a certain enzyme is essential at the time of feather-growth in the dermal tissues involved. The amount of enzyme produced is quite likely to be an inherited character modified through germinal variation. It is within possibility that those individual linnets originally introduced on the Hawaiian Islands happened to be fortuitously of a character deficient in enzyme. This character, as with conspicuous physical characters in many observed cases, might have been intensified through close breeding, until sufficient in degree to bring about an arrested tyrosin-oxidation, yellow or orange pigment resulting instead of red. This explanation appears to me somewhat more deserving of credence than any other that has come to mind. Yet this series of processes are of as yet so inscrutable a nature as to make the explanation offered tentative to the last degree.

Summary.—In estimates of color characters account must be constantly taken of the complex relations existing between the colors themselves, feather structure, and the process of wear.

In all available specimens of the linnet from its United States range the usual color (in the parts of the plumage which

are colored) of males after the post-juvenal molt, is red. There occur rather infrequently, irrespective of locality, individuals of three other color categories: yellow (most rarely), orange, and red with yellow or orange feathers intermixed.

A series of male linnets collected in the Hawaiian Islands in 1910 are all of the yellow or orange type of coloration. The linnet of the Hawaiian Islands is known to be of exotic origin. It is believed to have been introduced less than forty years ago, the imported individuals having been obtained in the vicinity of San Francisco, California, where the common *red* type is known to have prevailed ever since birds have been observed in the region, a period of sixty years at least.

The peculiarities of the Hawaiian linnet are similar to those presented in rare cases, sporadically, by the linnet of the mainland of North America and by individuals kept in confinement.

The foregoing consideration of the various factors which may have had to do with the acquiring by the Hawaiian linnet of the yellow or orange type of coloration exclusively, leads to the following conclusions: Their peculiarities as now presented are *not* to be considered manifestations of ordinary individual variation, *not* seasonal, and *not* the result of individual senility. Going back to the primary actuating causes they must be at root due in some way to change in habitat.

The physiological machinery by which these causes have brought about the ultimate results is doubtless extremely intricate, though portions of the process are becoming understood. The causes themselves may lie among a multitude of elements constituting the environmental complex.

Evidence is presented in this paper which would appear to eliminate the action of several of the more obvious environmental factors (temperature, humidity, change of food, reduction of enemies). One apparent circumstance would appear significant, however, namely, that the off-color character is associated with insularity of habitat. A deficiency in capacity, of the germ, for the formation of the appropriate enzyme may have been intensified through close breeding until the condition was reached where the amount of enzyme produced in the feather

anlage is insufficient to carry on oxidation of tyrosin beyond the yellow, or at farthest, the orange stage. (See Riddle, 1909.)

It is not inconceivable that the character of diminished color-production in the new habitat may have been induced many years later than the date of importation, and have resulted from the accumulated effects of some one or more environmental factors, not necessarily the same on all of the islands. But having once arisen, this character would have been intensified by close breeding, as others are known to be in cases of the breeding of domestic animals.

The exact nature of the colors and the manner of their production in birds seem to remain practically unknown.

Solution of the whole problem will doubtless rest upon a searching analysis of the conditions surrounding the linnet in all its habitats, together with experimentation upon living birds under control. But at the present time to assert emphatically any particular factor or group of factors as the prime stimulus, does not seem justifiable. The problem is an attractive one for investigation.

In closing this paper, I wish to acknowledge generous criticism from Professor H. B. Torrey, of the University of California.

TABLE I.

ENUMERATION OF 307 MALE LINNETS IN THE ATTEMPT TO CORRELATE THE DIFFERENT TYPES OF COLORATION WITH CLIMATIC AREAS.

Area	Climate	Usual crimson type	Crimson predominating, but more or less of orange feathers inter-mixed	Orange red type	Yellow type
Humboldt Bay region, northwestern California,	Humid; cool; equable	1	0	0	0
San Francisco Bay region and Santa Cruz faunal district, California,	Semi-humid; cool; equable	59	4	4	0
Coastal region of southern California, from Santa Barbara to San Diego,	Semi-arid; warm; equable	77	10	4	3
Sacramento and San Joaquin valleys, California,	Semi-arid; warm; equable	5	0	0	0
Modoc County, northeastern California,	Semi-arid; warm; variable	18	3	0	0
Mojave and Colorado deserts,	Extremely arid; hot; variable	21	0	1	1
Central and southern Arizona,	Arid; hot; variable	34	3	0	0
Northern Nevada,	Arid; warm; variable	5	0	0	0
Central and western Colorado,	Semi-arid; warm; variable	9	1	1	0
Santa Barbara group of islands (*C. clementis*)	Semi-arid; warm; equable	23	5	1	1
Whole western United States; total numbers of individuals in each category,		252	26	11	5
Proportion of each category in entire number tabulated (294),		85%	9%	4%	2%
Hawaiian Islands,	Humid; warm; equable	0	0	5	8
Proportion of each category to entire number (13),		....	....	38%	62%

TABLE II.

Individual Color-Characters of 13 Male Linnets Secured in 1910 in the Hawaiian Islands.

Museum Number	Locality	Date	Coloration*
12593	Oahu	Jan. 29	Deep chrome; forehead tending toward orange; uniform.
12594	Oahu	Jan. 29	Saturn red; forehead tending toward orange-vermilion.
12595	Oahu	Jan. 29	Pale orange-vermilion; large area on fore chest, chrome yellow; two albinotic feathers, one on throat, one on chest.
12598	Oahu	Jan. 29	Chrome yellow; areas sharply defined and rather restricted.
12610	Oahu	Feb. 16	Mixed, in all tracts: very pale burnt carmine, coral red and chrome yellow.
12601	Molokai	Feb. 9	Pale deep chrome; uniform.
12602	Molokai	Feb. 9	Orange-vermilion; uniform.
12607	Molokai	Feb. 12	Saturn red; uniform.
12612	Molokai	Feb. 29	Deep chrome, tending toward orange-buff; more nearly orange on forehead.
12613	Molokai	Mar. 1	Chrome yellow, approaching buff-yellow; areas sharply defined.
12614	Molokai	Mar. 2	Orange-buff on forehead; paler elsewhere, approaching buff-yellow.
12615	Molokai	Mar. 4	Buff-yellow, approaching cream color; the palest specimen of all.
12611	Maui	Feb. 22	Deep chrome; forehead approaching orange; uniform.

* Color names from Ridgway's *Nomenclature of Colors*, 1886 edition.

LITERATURE CITED.

Bryan, W. A.

1901. Key to the birds of the Hawaiian Group. Honolulu, Bishop Museum Press, 1901; pp. 1-76, pls. 16-30, figs. 1-17.

Dwight, J., Jr.

1900. The sequence of plumages and moults of the passerine birds of New York. Annals N. Y. Acad. Sci., v. 13, pp. 73-360, 7 pls.

Henshaw, H. W.

1902. Birds of the Hawaiian Islands, being a complete list of the birds of the Hawaiian Possessions, with notes on their habits. Honolulu, Thos. G. Thrum, 1902; pp. 1-146.

Keeler, C. A.

1893. Evolution of the colors of North American land birds. Occ. Papers Cal. Acad. Sci., San Francisco, 1893; pp. i-xii, 1-361, pls. 1-19.

Knowlton, F. H.

1909. Birds of the world. New York, Henry Holt & Co., 1909; pp. i-xiv, 1-873, 16 col. pls., 236 ils.

McGregor, R. C.

1901. Dichromatism in the genus Carpodacus. Condor, v. 3, January, 1901, pp. 13, 14.

1902. Notes on a small collection of birds from the island of Maui, Hawaii. Condor, v. 4, May, 1902, pp. 59-62.

Riddle, O.

1909. Our knowledge of melanin color-formation and its bearing on the Mendelian description of heredity. Biol. Bull., v. 16, May, 1909, pp. 316-351.

Ridgway, R.

1901. The birds of North and Middle America. Bull. U. S. Nat. Mus., no. 50, 1901, pp. i-xxx, 1-715, pls. 1-20.

Tower, W. L.

1906. An investigation of evolution in Chrysomelid beetles of the genus Leptinotarsa. Carnegie Inst. of Wash., Publ. no. 48, 1906, pp. i-x, 1-320, pls. 1-30, text-figs. 1-31.

Transmitted December 19, 1910.

Vol. 3.
1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
   Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
   Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
    Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
    Index, pp. 369-383.

Vol. 4.
1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
   Nos. 6 and 7 in one cover. April, 1908 ..... .50
   Index, pp. 395-400.

Vol. 5.
1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
   Nos. 6 and 7 in one cover. February, 1910 ..... .20

* Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.

9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.

10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15

11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.

12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Bioligical Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05

4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15

5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05

6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 5, pp. 197-199 February 18, 1911

THE MODESTO SONG SPARROW

BY

JOSEPH GRINNELL

BERKELEY
THE UNIVERSITY PRESS

Smithsonian
FEB 28
National Mus

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN
BERLIN

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

Nos. 1 and 2 in one cover ..... .60

3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

Nos. 6 and 7 in one cover ..... .25

8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 5, pp. 197-199 February 18, 1911

THE MODESTO SONG SPARROW

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

Melospiza melodia mailliardi, new subspecies.

TYPE.—Male adult; no. 16687, Univ. Calif. Mus. Vert. Zool.; Rancho Dos Rios, near Modesto, Stanislaus County, California; April 6, 1910; collected by Joseph Mailliard; orig. no. 7200.

DIAGNOSTIC CHARACTERS.—General size large, bill large, and markings broad and dark; resembles *Melospiza melodia maxillaris* closely in these respects, but shape of bill different, more nearly like that in *M. m. heermanni*.

REMARKS.—The bill is the distinctive feature of the new form *mailliardi*. Comparison with topotypes of *heermanni* shows the bill of *mailliardi* to be, as far as perceptible, identical in all proportions, though uniformly slightly larger. Comparison of the bill of *mailliardi* with that of *maxillaris* shows the two to be practically identical in outline as viewed from the side; but when viewed dorsally the bill of *mailliardi* presents a very much narrower outline, there being scarcely any indication of the lateral swellings of the maxilla characterizing the bill of *maxillaris*. (See *Univ. Calif. Publ. Zool.*, v. 5, April, 1909, pp. 265-267.)

In coloration *mailliardi* is very much darker than *heermanni*, having the streaking everywhere broad and black, with edgings of deep bay, the latter color showing dorsally to the almost entire exclusion of ashy marginings, there being mere traces of the latter. In coloration, *mailliardi* differs from *maxillaris* only in being a trifle less heavily marked on an average, that is, in "mass effect" of compared series.

The type of *mailliardi* measures as follows: wing, 63.9 mm.; tail, 61.5; tarsus, 21; culmen, 13; bill from nostril, 9.6; depth of bill, 7.5; width of maxilla at nostrils, 6.3.

The only material at hand of the new form is the series of twenty-five skins placed at my disposal by Mr. Joseph Mailliard, all taken by him on or near the Rancho Dos Rios, located at the confluence of the Tuolumne and San Joaquin rivers in Stanislaus County, near Modesto. I have no notion, whatever, as to what may be the subspecific status of song sparrows through the San Joaquin Valley either north or south of this point. Confluence of *mailliardi* with *maxillaris* to the northward, and with *heermanni* to the southward, may be presumed to exist. But I have not the least grounds for proof of true intergradation. Intergradation between forms of *Melospiza* has been confidently assumed in several cases, when subsequent careful field work has shown none to exist; for instance, between *M. c. heermanni* and *M. c. samuelis*, and *M. c. saltonis* and *M. c. cooperi*. The writer has as yet no access to song sparrows from the bed of the great San Joaquin-Sacramento basin, except from two limited localities —the Suisun marshes and the vicinity of Modesto.

Besides the twenty-five examples of *M. m. mailliardi* forming the basis of this study, there are three other skins in the Mailliard collection from the Modesto region, which I refer with very little hesitation to *M. m. maxillaris*.

It might be urged that these three specimens are merely individual extremes of the form the mode of which coincides with the characterization of *mailliardi*, as given above. Two reasons may, however, be given for considering these examples *maxillaris* rather than *mailliardi* with which they occurred.

(1) In the Museum series of fifty-five song sparrows from the habitat of *maxillaris*, there is not one individual varying so far toward the typical *mailliardi* that any question regarding its determination as *maxillaris* might possibly be raised. The reverse, namely that specimens exactly like *maxillaris* might occur as variants of *mailliardi*, is therefore not to be expected. This is particularly improbable when we consider that there are but twenty-eight specimens all told from the Modesto region.

(2) The three specimens in question are of midwinter dates:

no. 7165 (coll. J. and J. W. Mailliard), November 30; no. 7175, December 17; no. 7183, January 17. It will appear most reasonable, therefore, to assign these examples exactly as their characters indicate, and to consider them individuals of *maxillaris*; not as migrants, since the song sparrows of California, with the exception of *M. m. montana*, are non-migratory in the ordinary sense, but rather as stragglers invading a region not far distant from their birthplace as a result of the fall scattering movement. The latter consists in an emigration of certain individuals radially; but no fixed lines are followed, and no definite distances traversed. Individuals surviving the interim are believed to find their way back to some congenial locality near the starting point. This annual phenomenon is well known to affect even the most sedentary species and to involve birds-of-the-year chiefly if not altogether, leading them to visit for a few months in fall and winter regions not regularly inhabited by the species.

The type and a cotype of the new song sparrow herein described have been presented to the California Museum of Vertebrate Zoology by Mr. Joseph Mailliard. It has been through his special effort that the type series has become available, he having at the outset recognized the peculiarities of the form represented. It is quite proper, therefore, that the new bird be designated by the name chosen.

Transmitted January 6, 1911.

Vol. 3.
1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
Index, pp. 369-383.

Vol. 4.
1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
Nos. 6 and 7 in one cover. April, 1908 ..... .50
Index, pp. 395-400.

Vol. 5.
1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
Nos. 6 and 7 in one cover. February, 1910 ..... .20

* Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.

9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.

10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15

11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.

12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Bioligical Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05

4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15

5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05

6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 6, pp. 201-204 February 18, 1911

TWO NEW SPECIES OF MARMOTS FROM NORTHWESTERN AMERICA

BY

H. S. SWARTH

BERKELEY
THE UNIVERSITY PRESS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ
LEIPZIG

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN
BERLIN

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

Nos. 1 and 2 in one cover ..... .60

3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

Nos. 6 and 7 in one cover ..... .25

8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 6, pp. 201-204 February 18, 1911

TWO NEW SPECIES OF MARMOTS FROM NORTHWESTERN AMERICA

BY

H. S. SWARTH

(Contribution from the Museum of Vertebrate Zoology of the University of California)

Of the two species of marmots described in the following pages, one, *Marmota vancouverensis*, is based upon specimens secured on the Alexander Expedition to Vancouver Island in 1910. The other, *Marmota ochracea*, upon two skins included in a collection of birds and mammals made by C. L. Hall in the Yukon Region, Alaska, subsequently acquired by the University of California as a gift from Mrs. Phoebe A. Hearst, and now a part of the collection of the California Museum of Vertebrate Zoology.

Marmota vancouverensis, new species.

VANCOUVER ISLAND MARMOT.

TYPE.—Female adult; no. 12094, Univ. Calif. Mus. Vert. Zool.; Mt. Douglas (altitude 4,200 feet), twenty miles south of Alberni, Vancouver Island, British Columbia; July 8, 1910; collected by E. Despard; orig. no. 30; skin and complete skeleton.

DIAGNOSTIC CHARACTERS.—Belongs to the *caligata* group; about the size of *M. caligata* or *M. olympus*, but differing widely from either in coloration; differs cranially from *M. caligata*. (No skulls of *M. olympus* are at hand.)

COLORATION.—Dark brown above and below, varying through shades from burnt umber to seal brown, in some lights appearing almost black; tip of nose and chin, and an irregular streak along

center of breast and abdomen, white; a few white hairs scattered over dorsal surface of body.

Skull.—Compared with that of *M. caligata*: audital bullae smaller; nasals more narrow, and pointed posteriorly; palate broader and more shallow. The foramen in the parietal (immediately above the auditory meatus, and posterior to the posterior root of the zygoma) is very small, not more than half the size of that in *M. caligata*.

Measurements.—Type: total length, 720 mm.; length of tail vertebrae, 240; hind foot, 105; ear, 30. Average of five males: total length, 684 (660-710); length of tail vertebrae, 222 (200-300); hind foot, 98.4 (90-102); ear, 30. Average of six females: total length, 646.6 (580-720); length of tail vertebrae, 198.3 (170-240); hind foot, 92 (80-105); ear, 28.7 (24-30).

Remarks.—The eleven specimens of *Marmota vancouverensis* secured are quite uniform in coloration, allowing for the great difference between the old, worn pelage, and the new coat which most of them are just acquiring. One is in the new pelage throughout, the type is in fresh pelage except for a patch of old rusty hair on the tail, while the others are variously advanced in the molt, some of them being very ragged, and in spots quite bare of hair. As the long hairs wear off, the under fur becomes exposed, and this fades to a cinnamon or wood brown, many shades paler than the newly grown hair.

From the appearance of the specimens secured it would seem that the molt occurs but once a year in this species. There is no indication that a gray winter pelage is assumed, as in *M. olympus* of the mainland to the southward across the Straits of Juan de Fuca. The area covered by the white marking on the ventral surface varies among the specimens at hand, being most extensive on the type, and almost entirely absent on two of the others.

The series on which this description is based was secured in the vicinity of Mt. Saunders and Mt. Douglas, at the head of China Creek, some twenty miles south of Alberni, and within a radius of ten miles. The species is in all probability confined to Vancouver Island, and as far as known to the very small portion of it indicated above.

Marmota ochracea, new species.

Yukon Marmot.

Type.—Female adult; no. 5872, Univ. Calif. Mus. Vert. Zool.; Forty-mile Creek, Alaska, August 19, 1901; collected by C. L. Hall; orig. no. 477.

Diagnostic Characters.—Like *M. flaviventer*, from which it differs in coloration and pattern of markings.

Coloration.—Hairs of upper parts pale cinnamon-rufous basally, with a black central band. On the forepart of the body, from the neck to a point behind the shoulders, the hairs are the same color at the tip as at the base. From the middle of the body to the rump the exposed portions of the hairs are hoary whitish, producing a distinctly paler effect posteriorly. Tail uniform cinnamon-rufous above and below, slightly darker at the tip. Whole top of head from tip of nose to and including the ears, prout brown. Sides of head and neck, including the eyelids, the same color as the shoulders and sharply defined against the darker brown of the top of the head. Lower surface of the body and legs all around, hazel. Feet and claws black.

Skull.—Represented only by a fragment of the rostrum with incisors attached, and the lower jaw: Compared with skulls of *M. flaviventer* these parts are small and weak, the teeth conspicuously so.

Remarks.—Only two examples of the new species are at hand, an adult female and a young male, both from the head of Forty-mile Creek, a tributary of the Yukon crossing the Canadian boundary. The latter was mounted but has been removed from its stand. Both were prepared with the anterior portions of the skull left within the skin. Those of the adult have since been removed.

These two specimens differ from available skins of *M. flaviventer* from California and Colorado in various details of coloration and markings. They are more yellowish above and darker below, and lack the distinctive head markings of that species. In examples of *flaviventer* in comparable pelage the head and muzzle are much darker, sometimes black, with a conspicuous white

patch on lips and chin, sometimes including the top of the nose as well, markings entirely absent in the present species. In *flaviventer* the ventral surface of the tail is distinctly darker than the upper part, sometimes black; in *ochracea* the tail is uniformly colored above and below.

There are no measurements with the single adult example of *ochracea*, but the skin indicates an animal smaller than *flaviventer*. The young individual (about half grown) is practically like the adult, except that the hoary area above is more extensive, including the whole back, as well as the sides of the neck.

Transmitted December 27, 1910.

Vol. 3. 1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. Palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
Index, pp. 369-383.

Vol. 4. 1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
Nos. 6 and 7 in one cover. April, 1908 ..... .50
Index, pp. 395-400.

Vol. 5. 1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
Nos. 6 and 7 in one cover. February, 1910 ..... .20

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.

9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.

10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15

11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.

12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma Dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Bioligical Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05

4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15

5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05

6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 7, pp. 205-307 June 24, 1911

MAMMALS OF THE ALEXANDER NEVADA EXPEDITION OF 1909

BY

WALTER P. TAYLOR

Smithsonian Institution
JUL 8 1911
National Museum

BERKELEY
THE UNIVERSITY PRESS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ, LEIPZIG.

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN, BERLIN.

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

Nos. 1 and 2 in one cover ..... .60

3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

Nos. 6 and 7 in one cover ..... .25

8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 7, pp. 205-307 June 24, 1911

MAMMALS OF THE ALEXANDER NEVADA EXPEDITION OF 1909

BY

WALTER P. TAYLOR.

(Contribution from the Museum of Vertebrate Zoology of the University of California[1])

CONTENTS.

PAGE

Introduction 205
Check List of Species 208
General Accounts 208
New Species Described:
Microtus intermedius 253
Literature Cited 304

INTRODUCTION.

The material upon which the present report is based was collected during the months from May to August, inclusive, 1909, in northern Humboldt County, Nevada. The accomplishment of this work was made possible through means provided by Miss Annie M. Alexander. All of the specimens and notes resulting have been added by her to the collections of the Museum of Vertebrate Zoology of the University of California.

The regular collectors in the field were Charles H. Richardson, Jr., and the writer. Miss Louise Kellogg and Miss Alexander herself, who were members of a party carrying on palaeontologi-

[1] This is the fifth paper based primarily on the results of the 1909 Alexander Expedition to Nevada. (See Univ. Calif. Publ. Zool., vol. 5, pp. 275-281, 283-302, and 311-316, and vol. 7, pp. 173-177.)

cal work in Humboldt County in the interests of the University of California, also secured a number of mammals.

Localities represented in the entire collection of mammals are: Quinn River or Mason's Crossing, various points in the Pine Forest Mountains, and Virgin Valley. Nearly all of the localities referred to in this report may be found upon the Disaster Sheet of the United States Geological Survey's Topographic Map of the United States.

The writer is indebted to the Biological Survey, United States Department of Agriculture, for the loan of material necessary for comparison; to Dr. C. Hart Merriam, Mr. H. W. Henshaw, Mr. Vernon Bailey, and Mr. E. A. Preble for the identification of various specimens; to Mr. Wilfred H. Osgood, Assistant Curator of Mammalogy and Ornithology, Field Museum of Natural History, Chicago, for the identification of specimens of *Peromyscus* submitted to him; to Professor Charles A. Kofoid, head of the Department of Zoology of the University of California, and to Mr. Joseph Grinnell, Director of the California Museum of Vertebrate Zoology, both of whom have directly assisted the writer by generous criticism and direction.

Methods of Measurement.

All measurements are in millimeters unless otherwise specified.

Cranial Measurements, except where otherwise specified, are taken as follows:

Greatest length: length over all, from extreme anterior tip of nasals to most posterior point on skull.

Basilar length of Hensel: from inferior lip of foramen magnum to posterior margin of alveolus of incisor.

Zygomatic width: distances between outermost surfaces of zygomatic arches.

Mastoid width: greatest width of skull at mastoid processes.

Interorbital constriction: width of the most constricted part of the interorbital portion of cranium, including slight lateral bulges just below dorsal surface of skull, when these are present.

Interparietal: length, measured antero-posteriorly on skull along median line; width, measured laterally in widest place.

Nasals: greatest length along interlying suture.

Shelf of bony plate: distance from posterior ends of anterior palatine foramina to anterior border of interpterygoid fossa (post-palatal notch).

Palatine slits: greatest length of anterior palatine foramina.

Diastema: from anterior base of most anterior cheek-tooth to posterior base of incisor.

Post-palatal length: anterior border of interpterygoid fossa (post-palatal notch) to inferior lip of foramen magnum.

Maxillary tooth-row: alveolar length of cheek-tooth series, that is, the series of molariform teeth.

Height of cranium at bullae: measured (vertically to the basicranial axis of the skull) at point of greatest ventral bulge of auditory bullae.

Height of cranium above palate: measured (vertically to basicranial axis) from bony palate to dorsal surface of skull.

Height of cranium above basion: measured (vertically to basicranial axis) from inferior lip of foramen magnum to dorsal surface of skull.

External Measurements are those taken in the flesh by the collector. *Total length* is measured on the skinned body of the mammal, from tip of cartilage of nose to tip of tail; *tail vertebrae*, also measured on the skinned body from base of upper side of tail when bent at right angles to body to tip of tail; *hind foot*, from heel to tip of longest toe.

Averages include all the specimens listed. For example, averages of all adults in the various tables are obtained by adding the respective measurements or ratios of all the individuals; *not* by dividing by two the sum of the averages of the males and females in any case.

Ridgway's *Nomenclature of Colors*, Edition of 1886, has been used as the basis for color names.

In the following pages Breeding Season is used as a general term, including all of the following: (*a*) *mating period*, *i.e.*, time of running together and copulation; (*b*) *period of gestation*, *i.e.*, time between fertilization of the egg and the birth of the young; (*c*) *suckling period*, *i.e.*, time during which young are cared for by parent or parents.

CHECK-LIST OF THE SPECIES.

PAGE

1. Odocoileus hemionus (Rafinesque) 208
2. Antilocapra americana (Ord) 211
3. Marmota flaviventer (Aud. and Bach.) (?) 211
4. Citellus oregonus (C. H. Merriam) 213
5. Citellus mollis (Kennicott) 216
6. Ammospermophilus leucurus leucurus (C. H. Merriam) 219
7. Callospermophilus trepidus Taylor 220
8. Eutamias pictus (Allen) 222
9. Onychomys brevicaudus C. H. Merriam 228
10. Peromyscus maniculatus sonoriensis (LeConte) 228
11. Peromyscus crinitus (C. H. Merriam) 235
12. Reithrodontomys megalotis deserti Allen 237
13. Neotoma nevadensis Taylor 243
14. Neotoma cinerea occidentalis Baird 249
15. Microtus mordax (C. H. Merriam) 251
16. Microtus (Lagurus) intermedius, new species 253
17. Thomomys fuscus fisheri C. H. Merriam 258
18. Thomomys nevadensis C. H. Merriam 262
19. Perodipus microps levipes C. H. Merriam 267
20. Dipodomys merriami nevadensis C. H. Merriam 272
21. Perognathus parvus olivaceus C. H. Merriam 274
22. Perognathus nevadensis C. H. Merriam 279
23. Zapus princeps oregonus Preble 281
24. Erethizon epixanthum Brandt 287
25. Sylvilagus nuttalli grangeri (Allen) (?) 288
26. Lepus californicus wallawalla C. H. Merriam (?) 291
27. Lynx baileyi C. H. Merriam 293
28. Canis lestes C. H. Merriam 293
29. Taxidea taxus (Schreber) 296
30. Putorius cicognani (Bonaparte) 298
31. Putorius arizonensis Mearns 299
32. Sorex palustris navigator (Baird) 301
33. Myotis lucifugus longicrus (True) 302
34. Antrozous pallidus pallidus (LeConte) 303

GENERAL ACCOUNTS.

Odocoileus hemionus (Rafinesque).

Mule Deer.

Deer did not seem to be common in the mountains. Their scarcity may, of course, have been more apparent than real; for in our bird-shooting we probably frightened many of them from the neighborhood of our camps. However, when it is considered

that in the Pine Forest Mountains, which are in round numbers thirty miles long and fifteen miles wide, there are ten thousand range cattle, and twenty-two thousand sheep, with attendant cowboys and sheep-herders, there does seem to be good reason for a scarcity of deer.

The heavy snows of winter drive *Odocoileus* from the mountains onto the desert flat. Mr. F. M. Payne, of Quinn River Crossing, asserts that deer are often seen on nearby meadows during the winter months. This locality is about eight miles distant from the Pine Forest Mountains.

Tracks and signs were occasionally observed by us. On June 29 such evidence was seen on the east slope of Duffer Peak (altitude 9000 feet), and near Alder Creek Lake (7800 feet). Two prospectors, located at an elevation of 6500 feet on Big Creek, wounded a large buck the first week in July. Mr. Matthew Price, at the "Dugout Camp" (5000 feet), told of seeing deer tracks around his garden at about the same time.

According to Richardson's notes, entry made at the meadow (8500 feet) on Duffer Peak, deer tracks were seen all over a nearby ridge. A doe followed by two spotted fawns was seen on the mountain-side south of a meadow west of camp. One of the fawns, a male, was secured. "I was surprised to see them, as I had just been shooting small birds with the auxiliary barrel. When the deer were first descried, they were skipping along through the pines, the fawns often running ahead a short distance. The female occasionally sniffed the ground, but did not see me, though she evidently scented me when I was about 125 feet away. The trio stopped, and the doe sniffed the air. Fortunately there was a group of pines between myself and the deer, which gave me a chance to creep up within range. When I fired, the doe ran a little distance, then stopped, and I was able to get within seventy-five feet of her again. The glands on the hind legs of the fawn emitted an odor resembling pine pitch, only it was stronger."

Several cast horns of deer were picked up from time to time. A four-point antler was seen on a ridge near the 6000 foot camp on Alder Creek, west side of the mountains.

Deer beds were several times found. One observed on a high

ridge near Duffer Peak (altitude about 9000 feet) was on damp ground within ten feet of a snowbank. The deer usually choose to bed on pine needles at the foot of a boulder. A small hollow is made for this purpose and the brown pine needles on the earth around the bed offer a very good protective coloring. A distinct deer "trail" was seen on the highest ridge in the mountains running through a pass between large piles of boulders.

On July 30, as I was walking up a little draw, a doe was seen west of the Peak. Quaking aspens and white-bark pines grew in comparative abundance along the creek at this point. I suddenly saw the animal not more than forty feet from me on the other side of the stream, cropping the aspen leaves. She acted as though she felt something was wrong, but evidently neither heard nor saw me. When first observed she had her back toward me. Turning, she walked a few yards along the other side of the stream in my direction. Still she did not see me, although she seemed to scent danger and had stopped eating. While the doe was standing broadside to me, I made a squeaking sound with my lips. A nervous tremor seemed to run through her whole frame, and she looked around to see what was causing the disturbance. I called a second time. She wheeled about and faced me, her ears erect. At the third call she jumped again, and almost immediately turned and bounded up the mountain side. The rapidity of her disappearance was remarkable. She bounded diagonally up the steep slope, leaping over fallen trees and even over a huge boulder. All that was audible at her departure was the "chug! chug! chug!" for three times only as her four feet simultaneously hit the ground.

As we were travelling with pack-outfit around some open sage-covered ridges at an altitude of 7000 feet, a couple of deer suddenly sprang up from the bottom of a little draw not far below us, one being a buck with good-sized antlers. It seemed rather unusual to see deer in such open and exposed country. However, the prospectors living in the mountains assert that the bucks come down out of the pines at the time the fawns are born, while the does with their young remain in the higher parts of the mountains exclusively. Our limited observations of the deer are confirmatory of this statement.

Antilocapra americana (Ord).

American Prong-horned Antelope.

Mr. F. M. Payne of Quinn River Crossing reported antelope as still seen from time to time between the Crossing and Big Creek Ranch. On July 18 two antelope were seen by Miss Alexander and Miss Kellogg in Little High Rock Cañon, Washoe County. According to all reports antelope are much more numerous in the vicinity of Table Mountain and the low ranges to the west than in the immediate vicinity of the Pine Forest Range. Our party found no evidence of their presence.

Marmota flaviventer (Aud. and Bach.) (?)

Yellow-bellied Woodchuck.

The only evidence obtained of the presence of this animal was the discovery of a mandible (no. 7890) of some species of the genus at an elevation of 8000 feet near the head of Big Creek. The specimen is the left mandible of an adult. There are two teeth yet remaining, the incisor and first premolar.

In size the mandible is in most respects intermediate between two jaws of *flaviventer* at hand (belonging to specimens 7050 and 7051, Univ. Calif. Mus. Vert. Zool.). No. 7050 belonged to a young animal, while no. 7051 shows marks of age in its dentition and in the development of its processes, ridges, and fossae. The jaw from Nevada is practically between the two in all its characters, and does not vary to any noticeable degree away from them. The woodchuck from which this jaw came was probably a relatively young adult. Although the positive determination of its status is hardly possible with the material at hand, it may be concluded with a reasonable degree of assurance that it represents *flaviventer* or some closely allied form.

It should be mentioned in this connection that another species of woodchuck has been described from the Great Basin, namely *Marmota engelhardti* Allen, type locality Briggs Meadows (altitude 10,000 feet), Beaver Range Mountains, Utah. No measurements of the mandible are given in the description. Possibly this species from northern Nevada will be found to be nearly related to *engelhardti*.

Comparative Measurements of Woodchuck Mandibles.*

For method of taking measurements, see Introduction.
All dimensions are in millimeters.

	Marmota flaviventer(?) from the Pine Forest Mts., Humboldt Co., Nevada. No. 7890	*Marmota flaviventer* from Colorado		
		No. 7051 ♀ ad.	No. 7050 ♀ jv.	Average
Most anterior point of mandible to most posterior point of angular process	53.7	60.2	50.7	55.45
Perpendicular distance to highest point on articular process (mandible resting horizontally on a flat surface)	24.0	28.0	21.7	24.85
Distance from dorso-posterior angle of angular process to ventro-posterior angle of articular process	13.4	15.3	11.7	13.50
Height of jaw perpendicularly, measured at middle of premolar	12.1	14.0	9.9	11.95
Diastema—distance from posterior margin of alveolus of incisor to anterior margin of alveolus of premolar	10.4	12.5	11.0	11.75
Posterior margin of alveolus of last molar to most posterior point on angular process	23.6	27.3	19.3	23.30
Length of cheek-tooth series—anterior margin of alveolus of first cheek-tooth to posterior margin of last	18.0	19.1	18.6	18.85

* This table shows the jaw from Nevada to be intermediate between the two examples of *flaviventer* from Colorado in all characters of size considered except two, namely, *diastema* and *length of cheek-tooth series*. It is smaller than the juvenile *flaviventer* in these respects. It will be noted further that the measurements of no. 7890 are slightly less than the average of the other two specimens in all characters except *distance from dorso-posterior angle of angular process to ventro-posterior angle of articular process*, and *posterior margin of alveolus of last molar to most posterior point on angular process*.

Large burrows, some of them evidently recently used, were observed on several parts of the higher slopes of the mountains. I know of no other mammal than the woodchuck or badger, living at the altitudes (around 9000 feet) at which these burrows were observed, which could have made them. The possibility of the presence of badgers at this height is remote. However, no woodchucks were heard or seen at any time, although several weeks were spent in country which should have been inhabited by them.

If the species occurs at all in the Pine Forest Mountains, it is certainly only in very limited numbers; but if extinct it has only recently become so.

Citellus oregonus (C. H. Merriam).

Oregon Ground Squirrel.

Status.—Comparison of our specimens of the ground squirrel of the Pine Forest Mountains with two near topotypes of this species (no. 80507, male, Lost River, Klamath Basin, Oregon, September 23, 1896, E. A. Preble, and no. 80034, male, Lost River, Klamath County, Po Valley, Oregon, August 9, 1896, V. Bailey, loaned by the Bureau of Biological Survey) shows them to be referable to it. Their agreement in coloration is close, although there is no tendency manifested toward any particular concentration of buffy tawny on the nose, as in one of the topotypes (no. 80034). The brown area on the back is perhaps more extensive in some of our specimens than in the topotypes, but the latter differ between themselves in this regard. Many of our series, two in particular (nos. 8175, 8183), are very much worn. Apparently none have molted. The Oregon animals are sleek and presumably exhibit the fresh fall pelage. Our specimens were all taken from June 29 to July 22, while the examples from the Klamath Basin were secured in August and September.

There is a quite noticeable variation in color within our series, some having the sides pale, almost white, and others having them definitely buffy. The same may be said of the underparts. The intensity of chestnut on the lower surface of the tail varies also.

In size *oregonus* from the Pine Forest Mountains averages slightly larger than the type specimen of the species from the Klamath Basin (see table of measurements). It is significant of some local variation that the ratio of the length of the tail vertebrae to the total length is considerably more in our series of *oregonus* than in the type. That the females are larger-bodied than the males is evident; but the table shows further that the tails and hind feet average shorter in the females than in the males, making the ratio of tail vertebrae and hind foot to total length, respectively, less in the females than in the males. The

ratios of the type, a female, approach the tabulated ratios of the females of our series.

External Measurements of *Citellus oregonus* From the Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.
All dimensions are in millimeters.

Museum No.	Sex	Locality	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
8185	♂	Head of Leonard Creek	276	73	44	26.4	15.9
8180	♂	Meadow on Big Creek	266	69	44	25.9	16.5
8184	♂	Alder Creek	262	71	45	27.1	17.2
8175	♀	Near head of Big Creek	290	71	43	24.5	14.3
8183	♀	Alder Creek	273	64	42	23.4	15.4
		Average of the males	268	71	44.3	26.4	16.5
		Average of the females	281.5	67.5	42.5	23.6	14.8
		Average of all the adults	273.4	69.6	43.6	25.4	15.8
89177	♀	Type specimen of *Citellus oregonus** from Klamath Basin, Oregon	265	57	42	21.5	15.8

* See C. H. Merriam, 1898, p. 69.

Juvenals are in coloration practically small counterparts of their parents, though of course having very soft, silky hair. They may present somewhat more of a suffusion of buffy tawny on the nose, and do seem to be a little more dappled than the adults. The dappling is very fine, however, and is not at all comparable to that of *Citellus townsendi.*

Distribution.—Specimens were secured as follows: near head of Big Creek (altitude 8500 feet), 5; Big Creek (6000 feet), 2; Alder Creek (7000 feet), 4; head of Leonard Creek (8500 feet), 1. The distribution of the species is Upper Sonoran(?) and Transition, although at the higher altitudes the animals are found only in open, sage-covered meadows. Our records extend the known range of the species considerably to the south and east.

Habits.—*Citellus oregonus* is one of the most commonly distributed mammals on high meadows, being very numerous locally in the mountains, for example on a large meadow on Alder Creek, where the ground was literally honeycombed by burrows of the animal, as it sometimes is in southern California in regions badly infested by *Citellus b. fisheri*. When we traversed this meadow with our burro-train probably twenty squirrels scurried to cover. They were most common at this altitude (7000 feet), though quite a number were seen as high as 8500 and as low as 6000 feet.

Along Alder Creek they were common in all sorts of situations, their burrows and themselves being seen on open meadows, on exposed ridges, under huge boulders, in thick groves of quaking aspens, and under logs. They were observed most characteristically, however, on open meadows, where their erect and motionless attitude made them resemble stakes driven into the ground.

For the most part we found them to be rather shy. Their call-note has a whistle-like quality, and is made up of nine or ten connected, high-pitched "chips," of either monotone or descending inflection. The call may be imitated by a "chĭ-chĭ-chĭ-chĭ" rapidly repeated.

A burrow near which a juvenal was taken was dug out and found to have a tortuous course which turned upward after going down to a depth of six inches. The burrow was small compared with one near which an adult was shot, being about three inches in diameter. The opening of the larger burrow measured four inches in height by eight inches broad. Possibly the youngster was starting in for himself. As in the case of other *Citellus* there were good-sized mounds of earth outside of all burrows observed.

They have great tenacity of life, and generally manage to crawl out of reach though mortally wounded. If startled the speed with which they disappear is marvelous. One shot July 3 at an altitude of 6900 feet on Big Creek had its cheeks stuffed full of green weed-seeds.

Apparently we arrived on the scene of operations during the suckling period rather than the period of gestation. Three

juvenals (nos. 8174, 8176, 8177) were taken, the first two June 29, and the last July 1. One male (no. 8185) taken July 22 had the testes enlarged, and two females (nos. 8175, 8183), June 29 and July 14, respectively, showed by the condition of the teats that they had recently suckled young. There were two pairs of pectoral and three pairs of abdominal mammae. No females containing embryos were secured. Probably the young are born principally in April and May.

Of the twelve examples preserved, six are males and six females.

Citellus mollis (Kennicott).

Piute Ground Squirrel.

Status.—The type locality of *mollis* is given in the original description (Kennicott, 1863, p. 157) as Camp Floyd and Rocky Mountains, Utah. Our series of twenty-four specimens presents some of the characters as therein outlined, although several (nos. 8163, 8172, 8166, for example) have no "dirty creamy yellow" on the underparts, the color being white modified by the plumbeous bases showing through. The "distinct and prominent border and tip of white" on the tail is not apparent. One specimen only (no. 8165) possesses the white tail edging, the others having the margin and tip varying from light gray to buff. No mention of the coloration of the head is made by Kennicott. There is proportionally more buff on the sides of the neck and on the head than elsewhere. In general juvenals differ from the adults in the possession of softer and more silky pelage, the coloration being practically identical. One juvenal (no. 8314) is much darker than the adults, and has a richer buff-gray color on the head.

The measurements of *mollis* are given as follows: length 6.50 inches (= 165 mm.), and tail vertebrae 1.70 inches (= 43.1 mm.). Measurement of hind foot is not given. Taking the adults of our series into consideration, the dimensions of our specimens are greater than those given by Kennicott (see table). Possibly he measured a young specimen.

External Measurements of *Citellus mollis* From Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Locality	Total length	Tail vertebrae	Hind foot
8154	♂	Quinn River Crossing	202	55	35
8158	♂	Quinn River Crossing	207	57	34
8159	♂	Quinn River Crossing	199	48	35
8160	♂	Quinn River Crossing	200	51	33
8168	♂	Quinn River Crossing	220	60	31
8169	♂	Quinn River Crossing	207	55	33
8171	♂	Quinn River Crossing	204	56	33
	Average of the males		205.6	54.6	33.4
8156	♀	Big Creek Ranch	190	47	33
8157	♀	Big Creek Ranch	197	48	32
8161	♀	Quinn River Crossing	189	48	32
8163	♀	Quinn River Crossing	209	53	32
8165	♀	Quinn River Crossing	203	53	35
8166	♀	Quinn River Crossing	201	52	33
8167	♀	Quinn River Crossing	198	49	32
8170	♀	Quinn River Crossing	195	45	32
8172	♀	Big Creek Ranch	215	58	37
8173	♀	Big Creek Ranch	234	61	34
	Average of the females		203.1	51.4	33.2
	Average of all the adults		204.0	52.7	33.3

Distribution.—This pretty little ground squirrel was perhaps the commonest mammal on the flat of the high desert plateau. At Winnemucca on May 11 quite a number were observed. They were seen at intervals all along the stage route from Winnemucca to Quinn River Crossing. They were fairly common at Big Creek Ranch and at Wheeler Creek. None were found by our party above 4400 feet. A very careful search for the species during our short stay at Alder Creek Ranch (5000 feet) revealed burrows which were supposedly those of *mollis*, but the animals themselves were not observed. Apparently they decrease in numbers as the mountains are approached. We found them more numerous at Winnemucca, Amos, and Quinn River Crossing, each several miles from the mountains, than at any of the foothill stations. A juvenal was shot on Table Mountain, altitude approximately 6000 feet, near Virgin Valley, on June 7. An adult (no. 8315) and a very young juvenal (no. 8314) were secured in Virgin Valley (5000 feet).

Habits.—Young were taken on May 18, May 20, May 26, and June 7. Many others were seen in various stages of growth. Probably all the young are born about the first of May.

The Piute ground squirrels live in colonies. Rather extensive towns were found in some instances. On June 1 one such was found with many paths leading from hole to hole. The burrows are quite long. One was dug out at Amos for a distance of thirty feet (see figure 1). A nest was found in a large spherical cavity, so arranged that water could not have gotten into it. Fine straws made up the bulk of it, though white cotton twine had been very largely used to bind the straws loosely together. A couple of rags, a bit of rabbit-fur, some wool, and a down feather were also incorporated into the nest. Apparently the burrows intercommunicate.

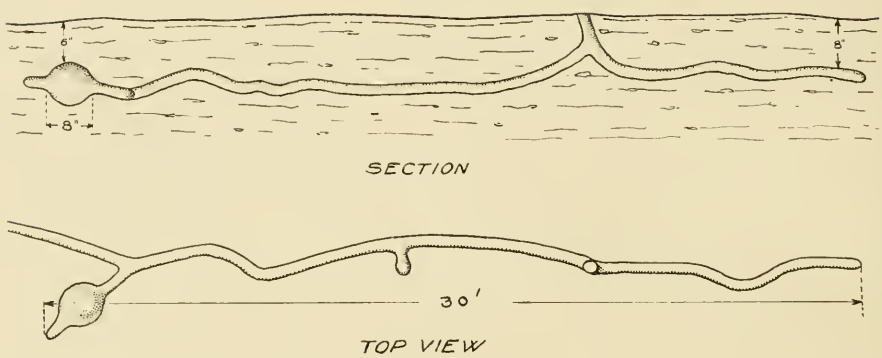


Fig. 1. Section and plan (diagrammatic) of burrow of *Citellus mollis;* nest cavity on left.

We were impressed with the fact that *Citellus mollis* resembles *Citellus tereticaudus* of the Colorado Desert in general habits and appearance. A very noticeable call-note, resembling "chēa!" is given from time to time. The young, as might be expected, are much bolder than the adults. They exhibit an instinctive immobility resembling somewhat the so-called death-feigning instinct. A couple of juvenals were seen in the low grass of the desert adjoining the Quinn River. One ran and escaped down a hole. The other made as if to do so, but sud-

denly stopped stock still and lay down flat on the ground, remaining perfectly quiet. I even walked up and touched the little animal with my foot, but it would not move. A similar case was observed on another occasion. The pelage of these juvenals harmonizes in color quite closely with the sandy soil, so that this habit, in conjunction with the coloration, may well be a decided advantage to the species. As a rule, soil which does not support much vegetation seems to be preferred. We could not decide, however, that the looser ground was selected; in fact, it seemed the other way about.

Their food is vegetable matter of various sorts. Bunch grass had been gnawed down to the roots in one place near a colony. The squirrels occasionally climb into the bushes.

At Big Creek Ranch a family was found living in an abandoned badger-hole. A very large colony was discovered near the river at Quinn River Crossing, but others were found several miles from the nearest water. Probably an ample supply of moisture is obtained from their vegetable food.

Ammospermophilus leucurus leucurus (C. H. Merriam).

Antelope Ground Squirrel.

Status.—A careful comparison of our series with topotypes of *leucurus* from San Gorgonio Pass (exact localities, Cabazon, Snow Creek, Whitewater Station, and Palm Springs) leads to the conclusion that the animals are typical of that species. The variation in size and color is no more than is found in a large series of *leucurus* from one locality.

Distribution.—Antelope ground squirrels were not common anywhere. Extensive trapping revealed their presence at Quinn River Crossing, and individuals were observed at the Big Creek, Alder Creek, and Leonard Creek ranches. More specimens were secured on the flat in Virgin Valley than elsewhere. Alder Creek was the highest point at which the species was noted, a male adult (no. 8218) and a male juvenal (no. 8219) being secured there on a ledge, altitude 5200 feet. In the original description of this species (C. H. Merriam, 1889, p. 20) no mention is made of its geographic range. Mearns (1907, p. 299) gives it as the Sonoran Zone, east of the Coast Range, on the Mexican line,

thence northeast along the Colorado River passing into the subspecies *cinnamomeus* in the Painted Desert of northeastern Arizona, and *interpres* in New Mexico and Texas. Nevada is not mentioned as part of its habitat. Bailey (1908, p. 8) includes the antelope squirrel among the mammals inhabiting the "arid interior," particularly the Humboldt and Carson valleys, Nevada. Records from northern Humboldt County thus definitely extend the known range of the species.

Habits.—An observer in the field is immediately impressed with the general similarity in habits of *Ammospermophilus leucurus* and *Citellus mollis*. The larger more strikingly colored tails of the former afford the best means of identification. (For remarks on coloration of the antelope squirrel see C. H. Merriam, 1890b, p. 52.) They were shy, and after seeing the collector were soon out of sight. Most of those noted were juvenals. The first young one was secured June 20 at Big Creek Ranch, and an older immature June 17 at the mouth of Alder Creek.

The species is typically one of the sagebrush flat, but ranges a few hundred feet higher up onto the barren foothill ridges. Apparently the squirrels do not venture very far from their burrows, which are very often among rocks. Seated on its haunches on a rock, one was heard to utter a chuckling note.

Callospermophilus trepidus Taylor.

Nevada Golden-mantled Ground Squirrel.

Habits.—The experience of our party in capturing this animal was very similar to that recorded by Allen (1895c, p. 336) and Grinnell (1908, p. 142) for other species of the genus, in that a large proportion of those secured were juvenals. Out of thirty-eight specimens taken by us only ten were fully adult. This shows that the young are born rather early in the summer. A number of females showed signs of having suckled young, but none contained embryos.

As already recorded (Taylor, 1910, p. 286), two of the adults and many of the juvenals were undergoing a molt into the brighter pelage. The other adults and juvenals had already assumed the post-breeding, or first winter pelage, respectively.

The first evidence of the presence of these squirrels was the

seeing of a half-dozen on a rocky ridge near Big Creek Ranch on June 12. They seem to be very partial to rocks, although they were found in many situations on the hillsides. Presumably all their burrows were located in the large piles of granite boulders which were found in many places.

A couple were seen in Big Creek Cañon below the "Dugout Camp" (4500 feet), one on the ground, the other in a small bush by the road. This was some distance from any rocks, and rather exceptional in our experience.

The name *trepidus* was suggested by their shy nature. At the least alarm they run pell-mell to the nearest shelter, and refuse to appear again. In behavior these animals remind one somewhat of ground squirrels (*Citellus beecheyi*). The juvenals are not nearly so diffident as the adults. They frolic about on the rocks, first running up to a high point to view the intruder, then dashing down the other side, only to reappear in a few moments. My attention was directed to a pair of the animals on a rocky hillside by their curious little "chips." One was chasing another and suddenly disappeared. The other ran around the rocks for some time, finally mounting a boulder and assuming a *Citellus*-like attitude. It remained sitting for some moments bolt upright with tail in air. Their actions are exactly those one might expect to observe in a chipmunk of their size. That they would be more shy, however, than the smaller species might be expected; and this is the case. As with birds, difficulty of approach is as a rule in direct ratio to the size of the mammal (see Coues, 1903, p. 15).

Mr. Matthew Price, the miner living at the "Dugout Camp" averred that this animal was a great pest to his garden. In fact, his two cats lived almost entirely on these rodents.

One squirrel taken had its cheek-pouches filled with green seeds about a quarter of an inch long. One of the animals was seen in a gooseberry bush.

Some data as to checks on this species were gathered. It is very probable that coyotes and badgers consume considerable numbers, as both are apparently very common in the mountains in the summer. The larger hawks come in for their share. On July 31 the writer was hunting in a broad pass east of Duffer Peak. A large western redtail (*Buteo borealis calurus*) swooped

down and caught a *Callospermophilus* and seemed to have difficulty in killing it. When the hunter approached, the bird picked up the squirrel and carried it a rod or so, finally letting it drop and taking flight. The animal, a fully adult male (no. 8258), was nearly dead when found. The bird had broken into the brain by way of the orbit. On August 4 a *Callospermophilus* was found dead under a tree near a small creek, with no discernible mark of violence on its body. This suggests that disease may be an important check.

The species is very common practically everywhere in the mountains, ranging from a few hundred feet above the flat almost to the summit of Duffer Peak (altitude 9400 feet). Proximity to water does not seem to determine distribution. It is a well-known fact (Seton, 1909, pp. 377, 391, and 409) that ground squirrels vary as to dependence upon a visible supply of water. Of the species taken by the Nevada Expedition, probably three, *Citellus mollis*, *Ammospermophilus leucurus*, and *Callospermophilus trepidus*, obtain sufficient moisture from their vegetable food. The other one, *Citellus oregonus*, was found to be apparently more dependent upon the water-supply, although our observations cannot be said to be conclusive on this point. Golden-mantled ground squirrels are found on rocky ridges, in the beds of cañons, in the sagebrush, on meadows and hillsides in the pine belt, on the shores of Alder Creek Lake, and in the quaking aspens; but in all observed cases their burrows occurred in rock-piles. It is obvious that, ranging from 4600 to 9000 feet as they do, they are not closely limited by conditions of temperature.

Eutamias pictus (Allen).

Desert Chipmunk.

Status.—In the original description of this form, Allen (1890, p. 115) gives external measurements as follows: total length, 210 mm. (in table, p. 66; but 219 in description, p. 115); length of tail vertebrae, 89; length of hind foot, 29. Adults of our series (from Quinn River Crossing) measure 192, 85, 28.8, and (from Pine Forest Mountains) 190, 81.7, 30.2. Thus our animals are slightly smaller than those measured by Allen.

In studying the characters of our series with the idea of comparing them with those as given by Allen in the original description, only fully adult animals were taken into consideration. The selection of these adults proved to be no small task. The most reliable characters are presented by the skulls. These are the size of the cranium and degree of development of its angles and processes, the transparency of the temporals and frontals (which is more extensive in young animals than in old), and especially the stage of tooth-wear. There is so much variation in these characters, excepting tooth-wear, that, taken individually they can by no means be regarded as conclusive evidences of the age of the animal. The pelage of young animals is more silky, shorter, and brighter than that of adults. The degree of development of the sexual organs is more misleading than anything else, for sexual maturity is reached quite early, often before the animal is fully adult. Specimens of our series especially illustrative of this are the following: nos. 7950, 7911, 7929, 7912, 7896. In cases in which a given individual of the series could not be said to be fully adult, even though it approximated the adult condition, it was eliminated.

Reasoning by analogy from chipmunks elsewhere it might be anticipated that those from the higher parts of the mountains would possess characters differentiating them from *pictus* of the desert flat. The type of *Eutamias palmeri* C. H. Merriam (1897c, p. 209) came from an altitude of 8000 feet on Charleston Peak, in southern Nevada. In the above-cited paper Merriam calls attention (p. 190) to the fact that while the sagebrush plains of the Great Basin are inhabited by *Eutamias pictus*, other species live in the higher mountains rising from the desert. The Pine Forest Mountains attain an altitude of 9400 feet. The differences between the "mountains" and "plains" series I found to be very slight, as shown beyond.

With the intention of determining whether there was any local variation in these chipmunks with altitude, adults collected by the Expedition from the sagebrush plain (altitude 4100 feet) and from the mountains above 6000 feet, mostly from 7000 to 9000 feet, were segregated and measurements tabulated, with the results shown in the table of measurements below. Skulls from

Quinn River Crossing (on the flat) are slightly smaller than those measured by Allen (1890, p. 67), and those from the mountains are slightly larger. The ratio of width to length is practically constant in the two selected series. As to external measurements, the total length and tail vertebrae are shorter in both mountain and plains series than in the types and topotypes the dimensions of which are given by Allen; the hind foot averages shorter in the Quinn River animals and longer in the mountain chipmunks than in Allen's specimens. The differences are not great, however, and probably indicate only a slightly differentiated local race.

In comparing the series with regard to coloration, it is of course absolutely necessary to determine the stage of the pelage (see Allen, 1890, p. 49, and C. H. Merriam, 1897c, p. 192). Apparently the very much worn grayish winter pelage, namely the breeding pelage, is represented in the Quinn River Crossing chipmunks. Those from the mountains are more puzzling. Several are in the process of molt, which suggests that some of them exhibit the breeding, others the post-breeding coat. Of the forty-six specimens taken above 7000 feet, seven (nos. 7940, 7959, 7955, 7951, 7952, 7948, and 7945) are either molting, or still wear the breeding pelage. These individuals are very similar in coloration to the Quinn River series. The mountain animals were trapped from June 25 to August 9, those from the plains being obtained from May 17 to June 20. In reality the two pelages, as exemplified by the two series of chipmunks, are not so different as might be expected. The mountain series is somewhat brighter (those exhibiting the summer pelage are here referred to), the sides having a wash of light buffy ochraceous which is lacking in the Quinn River specimens. Furthermore, the ventral surface of the tail is more nearly ochraceous than pale buff.

The Quinn River animals accord fairly well with Allen's characterization of *pictus* in the breeding pelage (1890, p. 115). The coloration, however, in our specimens is light gray rather than slate gray.

Distribution.—Specimens of *Eutamias pictus* were taken as follows: at Quinn River Crossing (4100 feet), 26; Big Creek

Ranch (4350 feet), 4; head of Big Creek (8000 feet), 19; Alder Creek Lake (7800 feet), 1; ridge near Duffer Peak (9000 feet), 2; Big Creek (7000 feet), 3; Alder Creek (6500 to 7000 feet), 7; Duffer Peak (9400 feet), 7; Leonard Creek (6500 feet), 7; Virgin Valley (5000 feet), 3. Besides these records based on specimens, the animals were listed from many other places. In fact the chipmunk was found wherever we traveled in the

External and Cranial Measurements of *Eutamias pictus* From Humboldt County, Nevada.

Adult *Eutamias pictus*, all from altitudes ranging from 4100 to 5000 feet.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Locality	External measurements: Total length	Tail vertebrae	Hind foot	Cranial measurements: Greatest length*	Greatest width†	Ratio width to length
7903	♂	Quinn River Crossing	188	82	29	29.5	16.5	55.9
8296	♀	Virgin Valley	189	85	30	29.6	16.6	56.1
7898	♀	Quinn River Crossing	200	82	26	29.6	16.6	56.1
7899	♀	Quinn River Crossing	191	88	29	28.6	16.7	58.4
7905	♀	Quinn River Crossing	192	88	29	30.0	16.0	53.3
7908	♀	Quinn River Crossing	.....	.....	30	29.3	16.0	54.6
	Average of all the adults		192.0	85.0	28.8	29.4	16.4	55.7

Adult *Eutamias pictus*, all from altitudes ranging from 6000 to 9400 feet.

7953	♂	Head of Big Creek, 9000 ft.	184	68	32	.....	.....	.....
7933	♂	Head of Big Creek, 9000 ft.	188	84	30	.....	.....	.....
7923	♂	Head of Big Creek, 8000 ft.	190	82	29	.....	.....	.....
7932	♂	Duffer Peak, 8800 ft.	.....	.....	31	31.7	17.3	54.6
7954	♀	Duffer Peak, 9400 ft.	197	86	31	.....	17.5	.....
7960	♀	Duffer Peak, 9000 ft.	194	84	29	31.6	17.6	55.7
7958	♀	Duffer Peak, 9000 ft.	189	82	29	31.8	17.8	56.0
7959	♀ yg.ad.	Duffer Peak, 8400 ft.	.....	.....	30	29.5	17.0	57.6
7935	♀	Head of Big Creek, 8000 ft.	.....	.....	30	31.9	17.5	54.8
7944	♀	Alder Creek, 7000 ft.	196	83	31	32.2	17.7	55.0
7943	♀ yg.ad.	Alder Creek, 7000 ft.	191	79	31	32.3	17.5	54.2
7945	♀	Alder Creek, 6000 ft.	188	88	30	.....	16.5	.....
	Average of the males		187.3	78.0	30.5	31.7	17.3	54.6
	Average of the females		192.0	83.6	30.1	31.5	17.4	55.5
	Average of all the adults		190.0	81.7	30.2	31.7	17.3	55.4

* Measured from most posterior portion supraoccipital to anterior end of nasals.

† Measured outside of zygomatic arches.

Great Basin. A few were seen at Winnemucca and at Amos. A number were observed between the latter station and Willow Point. They were almost omnipresent in the mountains, where they seemed to be much more common than on the desert proper. There was a belt from about 5000 feet in elevation up to 6000 feet in which chipmunks were rare. The range of *Eutamias pictus* by life-zones is, then, from Upper Sonoran up through Transition to Canadian, if any of the latter is represented on the Pine Forest Range.

Habits.—Of the seventy-five specimens taken fifty are females; thirteen of the twenty-two prepared examples from Quinn River Crossing are fully adult; of the series of forty-three specimens from other localities at greater altitudes twenty-two adults are at hand. Evidently our work was carried on during the suckling period. Most of the females had the mammary glands active; in many of the males the testes were enlarged. There are four pairs of mammae, one pectoral and three abdominal. None of the females secured contained embryos, which fact, together with the large number of young secured, indicates that the young are born during the early part of May or the latter part of April.

At Quinn River Crossing the chipmunks, although quite commonly trapped, were rarely seen. Their small size, silence, and extreme shyness were characteristic. When surprised they fled rapidly to their burrows with excited "chips." On May 25 two were seen playing in and under a good-sized sagebush (*Artemisia tridentata*) near our Quinn River camp. They moved about very rapidly and gracefully, and chased each other as if enjoying it immensely, although uttering no sound. When they ran, their tails were held high in air. Once or twice we heard them chatter, but not until we got into the mountains were their call-notes commonly heard. They were found indiscriminately on the open desert and near the stream, and seemed to be perfectly at home in the sagebrush. One was observed sitting on its haunches in a sagebush and chattering.

Chipmunks were universally present in the mountains, being found in all sorts of situations, namely on the sage flats and sage slopes, on recumbent logs, occasionally in white-bark pines (*Pinus*

albicaulis), among rocks and on rocky ridges, in a willow tree, in quaking aspens, and in chinquapin thickets. They are evidently early risers, and remain up until daylight wanes; for we found freshly-caught animals in our traps a little after five o'clock in the morning, and one was seen late in the evening on a log near our camp at the head of Big Creek. The chipmunks of the mountains are not nearly so shy and silent as those of the flat. Near the Duffer Peak meadow, elevation 8400 feet, chipmunks were extremely numerous, and far from wary. Compared with *Eutamias speciosus* (a species common in the mountains of southern California), they are not as noisy. They jump about upon the rocks, which appear to be their favorite situation, with the utmost agility, and I saw one run up the almost perpendicular face of a large stone. They have a very pretty way of waving their tails back and forth as they sit perched upon some convenient boulder. In actions they closely resemble *speciosus*. One seen in a white-bark pine jumped easily from branch to branch and finally to a pile of large boulders, disappearing therein. If one makes a squeaking sound with the lips they will often be induced to break forth into a series of characteristic chatterings, although they sometimes answer with a single call-note. The chipmunks are very curious, and one can generally, by squeaking, coax an animal from his hiding place.

On the meadow near Duffer Peak we heard the chipmunks utter a singular note which we took at first for that of a bird. It closely resembles the call-note of a thrush (*Hylocichla guttata*), and the chipmunk accompanies this utterance by a jerk of the tail.

They were observed feeding upon seeds, leaves of various plants, and pieces of toadstool or other fungi. In eating they sit bolt upright and hold the morsel between the forepaws in a typically squirrel-like manner.

A number were caught in chinquapin thickets high on the mountain sides. Several were obtained on the highest point of the range, Duffer Peak (altitude 9400 feet) where they were not uncommon. One was seen on July 23 running across a snowbank.

Onychomys brevicaudus C. H. Merriam

Short-tailed Grasshopper Mouse.

The only individual of this species taken was an adult female (no. 7883), trapped June 10 at Big Creek Ranch near a brushy plant on the desert. Compared with the specimens of *Onychomys* in the Museum collection and with the original description of *brevicaudus*, the specimen seems referable to that species. It measures, total length, 138 mm.; tail vertebrae, 40; hind foot, 19.

This mouse was described (C. H. Merriam, 1891, p. 52) from Blackfoot, Bingham County, Idaho. Bailey (1908, p. 13) asserts its abundance throughout the sage-brush valleys of the Great Basin country. In our experience it is one of the rarer mammals.

Peromyscus maniculatus sonoriensis (LeConte).

White-footed Mouse.

Status.—As would be expected from geographic considerations (see Osgood, 1909, pl. I, frontispiece), our series of 120 short-tailed *Peromyscus* is unquestionably referable to *sonoriensis*. The specimens accord well with Osgood's characterization (1909, p. 89).

"Barriers impassable to many other mammals have little effect on these mice, for they range continuously although not always without undergoing change from sea-level to great altitudes, and from the very humid to the very arid regions." (See Osgood, 1909, p. 17). In order to ascertain whether examples of the species from the highest parts of the Pine Forest Mountains would show any tendency to vary from the mode of specimens from the desert flat, I selected representative adults from various localities and tabulated the external and cranial measurements. The adults were selected on the basis of skull characters mainly, stage of tooth-wear being the most important. In the table only the very old adults are included.

It will be seen that the differences shown are very slight. There does seem to be a tendency in the white-footed mice of the mountains to be slightly smaller than those from the plains. This

is evident in all the measurements except length of tail vertebrae, dimensions of interparietal, shelf of bony palate (which is precisely the same in both series), and maxillary tooth row (which is a little longer in the animals with the smaller skulls). The ratio of length of tail vertebrae to total length is greater in the mountain animals. In this series, with the exception of length of tail vertebrae and hind foot, and length of palatine slits (which is the same in the two sexes), the females present the greater dimensions in each particular.

Old adults from localities ranging from 4100 to 9400 feet are similar in color, regardless of locality. They are all in the so-called pale phase of pelage (see Osgood, 1909, p. 89). From the worn and faded condition of the hair the conclusion seems justified that the pelage represented is the breeding coat. Description of one of these typical adult specimens (no. 8075, male), follows.

Ground color of upperparts between ochraceous buff and clay color; back slightly darker than the sides, the darker tint being due to an insprinkling of brown hairs; color of all the dorsal parts modified by dusky hairs; ears having a white spot present at anterior base; externally anterior half seal brown, posterior half lead gray, edged with white; internally dusky gray, covered with very short grayish white hairs; a bunch of buffy-ended hairs just posterior of light spot at their anterior insertion; underparts of animal pure white, hairs having plumbeous bases except on chin and parts of the fore leg; fore and hind feet white; tail white with a very distinct dorsal stripe nearest a vandyke brown tint. Though there are minor variations in the comparable series, they are very slight.

The series as a whole presents the variation that would be expected in any lot of *Peromyscus* of the same number. Fully two-thirds are young animals, quite a number evidently born this year.

A few examples (notably nos. 8018, 8029) are molting into the post-breeding or fresh fall pelage.

MEASUREMENTS OF *Peromyscus maniculatus sonoriensis* FROM HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Specimens taken 7000 feet or above.

Museum No.	Sex—All fully adult	Locality and its altitude	External measurements: Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Cranial measurements: Greatest length	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Interparietal	Nasals	Shelf of bony palate	Palatine slits	Diastema	Post-palatal length	Maxillary tooth-row
8075	♂	Duffer Peak, 8400 ft., Pine Forest Mts.	161	71	20	44.1	25.0	19.2	12.6	3.8	3.1× 9.0	10.0	3.5	5.7	6.6	8.7	3.5
8071	♂	Meadow, 7000 ft., Big Creek, Pine Forest Mts.	.....	....	20	.....	.....	.....	12.8	3.9	2.8× 9.6	9.4	3.6	5.5	6.4	....	3.5
8037	♂	Head of Big Creek, 8000 ft., Pine Forest Mts.	152	72	20	47.3	24.3	18.5	12.5	3.6	2.8× 8.3	9.2	3.5	5.3	6.7	8.5	3.3
8051	♂	Head of Big Creek, 8000 ft., Pine Forest Mts.	157	74	21	47.1	.....	.....	.....	3.9	....	9.3	3.6	5.0	6.8	....	3.2
8029	♂	Head of Big Creek, 8000 ft., Pine Forest Mts.	150	71	19	47.3	24.6	19.2	12.7	3.7	3.1× 7.9	9.7	3.8	5.1	6.6	9.0	3.4
8048	♂	Head of Big Creek, 8000 ft., Pine Forest Mts.	165	77	19	46.6	24.6	18.7	.....	3.7	2.2× 8.2	9.6	3.7	5.5	6.8	8.6	3.3
8064	♀	Head of Big Creek, 8000 ft., Pine Forest Mts.	166	75	19	45.1	25.3	19.5	13.2	4.0	2.7× 9.6	10.2	4.0	5.5	7.2	....	3.3
8018	♀	Head of Big Creek, 8000 ft., Pine Forest Mts.	158	72	20	45.5	.....	.....	12.7	4.0	....	10.0	3.7	5.2	6.8	....	3.7
8028	♀	Head of Big Creek, 8000 ft., Pine Forest Mts.	157	66	19	42.0	25.2	19.6	13.0	4.0	3.4× 9.0	9.6	3.8	5.3	6.7	9.4	3.4

MEASUREMENTS OF *Peromyscus maniculatus sonoriensis* FROM HUMBOLDT COUNTY, NEVADA —(*Continued*).

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Specimens taken 7000 feet or above.

Museum No.	Sex—All fully adult	Locality and its altitude	External measurements: Total length	Tail vertebrae	Hind foot	Ratio tail vertebrae to total length	Cranial measurements: Greatest length	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Interparietal	Nasals	Shelf of bony palate	Palatine slits	Diastema	Post-palatal length	Maxillary tooth-row
8072	♀	Meadow, 7000 ft., Big Creek, Pine Forest Mts.	.....	....	20	.....	.....	.....	.....	3.7	....	9.7	3.8	5.2	7.2	....	3.7
		Average of the males	157.0	73.0	19.8	46.48	24.6	18.9	12.6	3.7	2.8× 8.6	9.5	3.6	5.3	6.6	8.6	3.3
		Average of the females	160.3	71.0	19.5	44.20	25.2	19.5	12.9	3.9	3.0× 9.3	9.8	3.8	5.3	6.9	9.4	3.5
		Average of all the adults	158.2	72.2	19.7	45.62	24.8	19.1	12.7	3.8	2.8× 8.8	9.6	3.7	5.3	6.7	8.8	3.4

Specimens taken below 5000 feet.

8304	♂	Virgin Valley, 5000 ft.	177	85	20	48.0	24.6	18.3	.....	4.2	2.4×10.0	9.0	....	5.0	6.8	....	3.4
8309	♂	Virgin Valley, 5000 ft.	.....	72	20	.....	25.7	19.8	12.7	4.0	2.6× 7.9	10.1	3.8	5.7	7.3	9.1	3.4
8082	♂	Mouth of Alder Creek, 5000 ft., Pine Forest Mts.	164	74	21	45.1	25.7	20.1	13.7	3.9	3.0× 7.9	10.3	3.9	6.0	7.4	9.3	....
8016	♂	Big Creek Ranch, 4350 ft., Pine Forest Mts.	164	75	20	45.7	25.3	19.7	12.9	4.0	2.8× 9.0	9.8	3.8	5.4	7.0	9.0	3.4
8006	♂	Quinn River Crossing, 4100 ft.	152	62	19	40.8	24.8	18.9	12.0	3.9	2.6× 7.8	10.5	3.9	5.3	7.3	8.6	3.5
8007	♂	Quinn River Crossing, 4100 ft.	149	66	20	44.3	24.6	19.0	.....	3.8	2.6× 9.2	10.7	3.7	5.6	6.7	9.0	3.3
8004	♂	Quinn River Crossing, 4100 ft.	157	66	20	42.0	25.1	20.0	13.3	4.0	2.3× 9.1	10.2	3.8	5.5	7.0	9.6	3.3
8001	♀	Quinn River Crossing, 4100 ft.	171	77	22	45.0	25.7	19.3	12.7	4.0	3.0×10.0	10.3	3.6	5.7	6.9	9.3	3.3
		Average of all the adults	162.0	72.1	20.2	44.41	25.1	19.3	12.8	3.9	2.6× 8.8	10.1	3.7	5.5	7.0	9.1	3.3

Distribution.—Our specimens of *Peromyscus maniculatus sonoriensis* were recorded as follows: Quinn River Crossing (4100 feet), 18; Big Creek Ranch (4350 feet), 3; head of Big Creek (8000 feet), 60; Big Creek (6000 to 7000 feet), 6; Duffer Peak (8400 to 9400 feet), 12; Alder Creek (5000 to 7000 feet), 8; Leonard Creek (6500 feet), 7; Virgin Valley (5000 feet), 9. These localities range from Upper Sonoran to Canadian, if any of this life-zone is actually represented on the Pine Forest Mountains. They were more abundant at the head of Big Creek (Transition) than at any other place we visited.

In the list of localities from which specimens of *sonoriensis* were examined, Osgood includes Granite Creek (Granite Range, Washoe County); Cottonwood Range (the Santa Rosa Mountains of the topographic maps of the United States Geological Survey) near Amos; MacDermitt, which lies a little north of east of Quinn River Crossing over several low ranges of desert mountains near the Oregon line; Summit Lake, lying west of the Pine Forest Range, and Winnemucca. The species is universally distributed over the northern part of the Great Basin, being found wherever any terrestrial mammals of any kind have been taken.

Habits.—White-footed mice were found in every available type of environment (see Osgood, 1909, p. 26). On June 26, at the head of Big Creek, altitude 8000 feet, a *Peromyscus* was caught four feet from the stream near a white-bark pine, on very moist ground. Another was captured in grass under a sage-bush, twenty feet from water. Others were caught all the way up to the top of the dry and barren ridge, a single individual being taken among the rocks in the latter situation. Many were caught near small holes, and some beside rocks, under which, or in burrows near which, they appeared to live. The mice were caught in willows at the lowest point touched by the Expedition, Quinn River Crossing (4100 feet), and at the highest point, namely, the rocky pine-covered ridge forming what is known as Duffer Peak (9400 feet). A list of the environments includes the following: (1) dry, sandy washes; (2) moist grassy meadows; (3) the open desert at a considerable distance from the stream; (4) the banks of the Quinn River, in willows and other

vegetation; (5) steep, rocky mountain sides; (6) along mountain creeks in dark, damp situations; (7) by fallen trees; (8) in rock-piles; (9) in chinquapin thickets; (10) in sagebrush; (11) in dry leaves in the bottoms of cañons; (12) in rocks on the summits of ridges; (13) in the white-bark pine belt, and (14) in the mountain mahogany (*Cercocarpus ledifolius*) region.

One female *Peromyscus* (no. 8028) was parasitized by two enormous rabbit-fly larvae, but did not seem to be in poor condition, and was about to give birth to five young.

Some of these mice were caught in deserted Oregon ground squirrel burrows in a meadow on Big Creek (altitude 7000 feet). Evidently they "jump" abandoned squirrel claims. There is a slight possibility that they are sometimes parasitic upon these squirrels (see Seton, 1909, p. 386).

That the period of gestation extends over at least several months is obvious from an inspection of the tables prepared to exhibit the data obtained. During all the summer months females containing embryos were as likely to be captured as females suckling young. As for the breeding of the species throughout the year (see Osgood, 1909, p. 27), I think it unlikely in northern Nevada, as the extreme cold of the winter probably inhibits sexual activity. It is interesting to note that a large proportion of the sexually active animals obtained were not fully adult, but are more properly to be termed "adolescent," being young of the previous year.

Tabulation of Breeding Data of Males of *Peromyscus maniculatus sonoriensis* From Humboldt County, Nevada.

Explanation.—All the males here listed have the genital organs highly developed, indicating sexual activity. They were all marked "testes large" in the field by the collector. Males at Quinn River Crossing did not appear to be breeding in numbers during the latter part of May and the first of June. The great majority of the sexually active animals are young adults or old juvenals. Some are still in the adolescent pelage. Few have assumed the buffy-ochraceous clay-colored pelage of the older adults.

Museum No.	Locality	Altitude	Date of capture
8004	Quinn River Crossing	4100 ft.	May 19, 1909
8006	Quinn River Crossing	4100	29, 1909
8021	Head of Big Creek, Pine Forest Mts.	8000	June 25, 1909
8019	Head of Big Creek, Pine Forest Mts.	8000	25, 1909
8017	Head of Big Creek, Pine Forest Mts.	8000	25, 1909
8030	Head of Big Creek, Pine Forest Mts.	8000	26, 1909
8033	Head of Big Creek, Pine Forest Mts.	8000	26, 1909
8031	Head of Big Creek, Pine Forest Mts.	8000	26, 1909
8029	Head of Big Creek, Pine Forest Mts.	8000	26, 1909
8043	Head of Big Creek, Pine Forest Mts.	8000	28, 1909
8044	Head of Big Creek, Pine Forest Mts.	8000	28, 1909
8046	Head of Big Creek, Pine Forest Mts.	8000	28, 1909
8041	Head of Big Creek, Pine Forest Mts.	8000	28, 1909
8049	Head of Big Creek, Pine Forest Mts.	8000	29, 1909
8048	Head of Big Creek, Pine Forest Mts.	8000	29, 1909
8054	Head of Big Creek, Pine Forest Mts.	8000	30, 1909
8052	Head of Big Creek, Pine Forest Mts.	8000	30, 1909
8053	Head of Big Creek, Pine Forest Mts.	8000	30, 1909
8051	Head of Big Creek, Pine Forest Mts.	8000	30, 1909
8056	Head of Big Creek, Pine Forest Mts.	8000	July 1, 1909
8055	Head of Big Creek, Pine Forest Mts.	8000	1, 1909
8060	Head of Big Creek, Pine Forest Mts.	8000	2, 1909
8061	Head of Big Creek, Pine Forest Mts.	8000	2, 1909
8067	Big Creek, Pine Forest Mts.	6000	7, 1909
8068	Big Creek, Pine Forest Mts.	6000	7, 1909
8070	Meadow, Big Creek, Pine Forest Mts.	7000	9, 1909
8073	Duffer Peak, Pine Forest Mts.	8400	11, 1909
8075	Duffer Peak, Pine Forest Mts.	8400	11, 1909
8076	Alder Creek, Pine Forest Mts.	7000	13, 1909
8077	Alder Creek, Pine Forest Mts.	7000	13, 1909
8091	Head of Big Creek, Pine Forest Mts.	8000	25, 1909
8103	Leonard Creek, Pine Forest Mts.	6500	Aug. 3, 1909
8104	Leonard Creek, Pine Forest Mts.	6500	3, 1909
8105	Leonard Creek, Pine Forest Mts.	6500	3, 1909
8108	Leonard Creek, Pine Forest Mts.	6500	4, 1909

Tabulation of Breeding Data of Females of *Peromyscus maniculatus sonoriensis* From Humboldt County, Nevada.

Museum No.	Locality	Altitude	Date of capture	No. of embryos
8001	Quinn River Crossing	4100 ft.	May 18, 1909	6
8003	Quinn River Crossing	4100	19, 1909	7
8011	Quinn River Crossing	4100	June 5, 1909	6
8018	Head of Big Creek, Pine Forest Mts.	8000	25, 1909	5
8026	Head of Big Creek, Pine Forest Mts.	8000	25, 1909	4
8023	Head of Big Creek, Pine Forest Mts.	8000	25, 1909	5
8025	Head of Big Creek, Pine Forest Mts.	8000	25, 1909	7
8028	Head of Big Creek, Pine Forest Mts.	8000	26, 1909	5
8045	Head of Big Creek, Pine Forest Mts.	8000	28, 1909	7
8047	Head of Big Creek, Pine Forest Mts.	8000	29, 1909	6
8057	Head of Big Creek, Pine Forest Mts.	8000	July 1, 1909	4
8066	Head of Big Creek, Pine Forest Mts.	8000	4, 1909	4
8063	Head of Big Creek, Pine Forest Mts.	8000	4, 1909	6
8064	Head of Big Creek, Pine Forest Mts.	8000	4, 1909	4
8072	Meadow, Big Creek, Pine Forest Mts.	7000	9, 1909	2
8078	Alder Creek, Pine Forest Mts.	7000	14, 1909	6
8100	Meadow, Duffer Peak, Pine Forest Mts.	8400	31, 1909	4
8109	Leonard Creek, Pine Forest Mts.	6500	Aug. 8, 1909	6
	Average number in a litter			5

Peromyscus crinitus (C. H. Merriam).

Cañon Mouse.

Status.—Our three specimens of long-tailed *Peromyscus* are thus identified by Osgood. One is an adult male (no. 8110), the other two juvenal males (nos. 8111, 8112). The adult is evidently undergoing ecdysis from the breeding into the post-breeding pelage, as a molt line is discernible about a third of the way from

the nose to the tail. The animal in coloration agrees well with the characterization of this form by Osgood (1909, p. 230). There is a pectoral spot of buff present. The two juvenals have no buffy anywhere on the pelage, and are of a uniform mouse gray. Ventrally more or less of the plumbeous bases of the hairs show through, modifying the otherwise pure white of that region.

The cranium of the adult Nevada specimen conforms well with Osgood's description (1909, p. 230). However, the rostrum, though depressed, exhibits no dorsal rounding. The skulls of the immatures are smaller than that of the adult in every measurement except that of the shelf of bony palate.

External Measurements of Three Specimens of *Peromyscus crinitus* From Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.
All dimensions are in millimeters.

Museum nos. and sex	8110 ♂ ad.	8111 ♂ juv.	8112 ♂ juv.
Total length	170	147	156
Tail vertebrae	90	77	80
Hind foot	21	18	20
Ear from notch (measured in dry skin)	18	14.5	13
Ratio tail vertebrae to total length	52.9	52.3	51.2

Measurements of Three Skulls of *Peromyscus crinitus* From Pine Forest Mountains, Humboldt County, Nevada.

Museum nos. and sex	8110 ♂ ad.	8111 ♂ juv.	8112 ♂ juv.
Greatest length	24.3	23.0	.....
Basilar length of Hensel	18.4	17.0	.....
Zygomatic width	11.9	11.6	.....
Interorbital constriction	4.1	4.1	4.1
Interparietal	2.8×9.8	.....	.....
Nasals	9.0	8.1	8.6
Shelf of bony palate	3.6	3.8	3.7
Palatine slits	5.2	4.8	4.8
Diastema	6.0	5.2	5.2
Postpalatal length	8.6	7.9	.....
Maxillary tooth row	3.4	3.3	3.4

Habits and Distribution.—The cañon mouse was recorded from two localities only, both in the Pine Forest Mountains. The adult and one of the juvenals (nos. 8110, 8111) were caught in the rocks on the north side of a ridge near Big Creek Ranch at

an altitude of 4800 feet. The other juvenal was trapped at the head of Big Creek (altitude 8000 feet). The first locality is in Upper Sonoran, but the second is possibly in Transition. Osgood records the species as an Upper Sonoran zone animal.

The fact that the three mice here recorded were the only ones secured, although a large number of traps were run daily for two months in localities apparently as favorable for their habitation as the places where they were actually caught, seems to confirm Osgood's statement (1909, p. 230) that the species is rare.

Reithrodontomys megalotis deserti Allen.

Desert Harvest Mouse.

Status.—The material at hand consists of thirty-one specimens, twenty-two of which are fully adult. This series presents characters which are different from any *Reithrodontomys* of which examples are available at this time, and it is only provisionally that these specimens from northern Nevada are referred to *deserti*.

A series of *Reithrodontomys m. deserti* from Victorville, on the Mohave Desert of California, is accessible. The type locality of *deserti* (Allen, 1895a, p. 127) is Oasis Valley, Nye County, Nevada. Specimens from Winslow, Arizona, from Nye and Esmeralda counties, Nevada, and Inyo County, California, are referred to this subspecies by Allen. Bailey (1908, p. 16) considers the *Reithrodontomys* of the northern part of the Great Basin as belonging to it. From geographical considerations it might be anticipated that *klamathensis* (C. H. Merriam, 1899, p. 93), type locality Big Spring, "Mayten," Shasta Valley, California, would invade northern Nevada. Three specimens of this form have been loaned the writer by Dr. C. Hart Merriam. Two of these individuals are young adults, taken on September 19, the third being a fully adult animal secured July 12. Our series was collected between May 14 and June 17. The Victorville specimens of *deserti* are March animals, so not strictly comparable as to pelage. The probabilities are, too, that specimens from this locality are not absolutely typical of the subspecies *deserti*.

The examples from northern Nevada are evidently nearer

deserti as exemplified by the Victorville series than to either *klamathensis* or *longicauda*. As compared with the Victorville specimens of *deserti*, however, they are paler; the hind foot is shorter; the ratio of the length of the tail vertebrae to the total length is less (see table of measurements). They are distinguished from *Reithrodontomys klamathensis* by much paler coloration and smaller size.

External Measurements of 22 Adult *Reithrodontomys m. deserti* From Humboldt County, Nevada.

For method of taking measurements, see Introduction.
All dimensions are in millimeters.

Museum No.	Sex	Locality	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
8187	♂	Quinn River Crossing	141	67	16	47.5	11.3
8199	♂	Quinn River Crossing	133	61	16	45.8	12.0
8200	♂	Quinn River Crossing	127	65	17	51.2	13.4
8193	♂	Quinn River Crossing	144	71	17	49.3	11.8
8190	♂	Quinn River Crossing	150	73	16	48.7	10.7
8201	♂	Quinn River Crossing	141	67	17	47.5	12.0
8209	♂	Big Creek Ranch	.....	....	17	.....	.....
8210	♂	Big Creek Ranch	135	66	17	48.8	12.6
8194	♂	Quinn River Crossing	.....	....	17	.....	.....
8191	♂	Quinn River Crossing	136	66	16	48.5	11.8
8208	♂	Quinn River Crossing	145	75	17	51.7	11.7
8211	♂	Big Creek Ranch	143	70	....	48.9	.....
8195	♂	Quinn River Crossing	125	61	15	48.8	12.0
8186	♂	Quinn River Crossing	123	64	16	52.0	13.0
8312	♂	Virgin Valley	137	66	17	48.2	12.4
		Average of the males	136.9	67.0	16.50	48.99	12.00
8189	♀	Quinn River Crossing	136	65	15	47.8	11.0
8192	♀	Quinn River Crossing	139	66	17	47.5	12.2
8204	♀	Quinn River Crossing	139	71	17	51.1	12.2
8202	♀	Quinn River Crossing	143	70	16	49.0	11.2
8188	♀	Quinn River Crossing	142	67	15	47.2	10.6
8196	♀	Quinn River Crossing	131	58	16.5	44.3	12.6
8207	♀	Quinn River Crossing	.....	....	16	.....	.....
		Average of the females	138.3	66.1	16.07	47.80	11.60
		Average of all the adults	137.3	66.7	16.30	48.60	11.88

Comparative Measurements of Other Species of *Reithrodontomys*.

All dimensions are in millimeters.

	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
Average of 58 specimens *R. m. megalotis**	134.4	62.2	17.5	46.2	13.0
Average of 128 specimens *R. m. deserti**	136.1	69.0	17.4	50.7	12.8
Average of 62 specimens *R. m. longicauda**	137.1	71.9	16.9	52.4	12.3
Average of 4 specimens *R. klamathensis*†	146.2	70.7	17.8	48.4	12.2

* See Allen, 1895, p. 141, etc.

† See C. H. Merriam, 1899, p. 93.

No. 8190, male adult, taken at Quinn River Crossing on May 18 may be regarded as typical of the series. Coloration of upper parts buffy, darkened along the middle of the back by an insprinkling of slate-black and cinnamon; general impression of the upper parts more of a brownish than a blackish, differing in this respect from *Reithrodontomys* of presumably contiguous range, which have more black intermixed; ears light brown; ear-tufts white with buffy endings; whiskers vary, some being black, others brown; sides of animal pale, clearly distinguishable in this regard from *deserti* as represented by the Victorville examples, and from *klamathensis; deserti* has the sides ochraceous, or even darker than ochraceous, instead of pale-buffy, and *klamathensis* has the sides similar to those of the Nevada specimens, but darker. Feet white; underparts silvery-white, all the hairs except those on the throat having plumbeous bases; a line of white present on the lower part of the cheeks and around the mouth; tail well-haired, seal brown above, white below.

One is impressed at first sight by the larger size of these specimens as compared with *deserti* from the Mohave Desert. Actual measurements, however, show this greater size to be merely apparent, and due to greater length and fluffiness of the pelage. The length of the tail vertebrae of the animals from northern Nevada is intermediate on the average (see table of external

measurements) between *R. m. megalotis* and *R. m. deserti.* As regards the hind foot, it is a millimeter less than either. The total length of the animal is slightly greater than in either of the two species. This local race is slightly smaller in all three external measurements than *Reithrodontomys klamathensis,* but in the ratio of length of tail vertebrae to total length accords closely therewith. The same ratio is less in this northern Nevada race than in *deserti* from California. A slight difference between the two is shown also by the ratio of the length of the hind foot to the total length.

The most evident feature of the coloration in general is its marked paleness. It is true that specimens of *deserti* at hand approach it in this respect, but they do not equal it. *Klamathensis,* at least as exemplified by the specimens at hand, cannot possibly be confused with the Nevada series because it is so much darker dorsally. Apparently any of our series can be differentiated by the general paleness of coloration and short hind foot.

As to cranial characters (see table of cranial measurements), the rostrum averages slightly narrower than in *klamathensis* or in *longicauda* (of which five skulls are at hand); the bullae are a little more prominent than in *klamathensis.* The skulls, according to the tabulated measurements, exhibit a tendency to be intermediate between *klamathensis* and *longicauda* in size, being larger than the former and smaller than the latter, in the following respects: greatest length, width of skull immediately posterior of point of junction with the skull of zygomatic arches posteriorly, and height of cranium at auditory bullae. The tooth row is longer in the Nevada specimens than in either of the other species. There is much variation in cranial characters. Individual examples have the rostrum broad.

Cranial Measurements of Three Species of *Reithrodontomys*.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Species	Greatest length	Width of skull; immediately anterior of point of junction with the skull of zygomatic arch posteriorly	Width of rostrum; immediately anterior of point of junction with the skull of zygomatic arch anteriorly	Maxillary tooth-row	Height of cranium at auditory bullae	Ratio of height of cranium at bullae to greatest length
8209	♂ ad.	*Reithrodontomys m. deserti*	.....	10.0	3.3	3.2	7.5	.....
8124	♂ ad.	*Reithrodontomys m. deserti*	20.0	10.2	3.0	3.0	7.7	38.5
8190	♂ ad.	*Reithrodontomys m. deserti*	21.0	9.9	3.3	3.0	7.5	35.7
8200	♂ ad.	*Reithrodontomys m. deserti*	20.7	9.7	3.3	3.0	7.4	35.7
Average of all the adults			20.56	9.95	3.22	3.05	7.52	36.63
95456	♂*	*Reithrodontomys klamathensis*	20.4	9.9	3.4	3.1	7.6	37.2
95457	♂*	*Reithrodontomys klamathensis*	19.9	9.8	3.1	2.9	7.4	37.2
97883	♂	*Reithrodontomys klamathensis*	20.8	10.0	3.4	3.1	7.4	35.6
Average of all the adults			20.56	9.95	3.22	3.05	7.52	36.63
7446	♂ ad.	*Reithrodontomys m. longicauda*	20.2	10.0	3.3	3.1	7.6	37.6
3068	♂ ad.	*Reithrodontomys m. longicauda*	20.3	10.0	3.1	2.9	7.7	38.0
2397	♂ ad.	*Reithrodontomys m. longicauda*	21.3	10.0	3.5	3.0	7.7	36.1
Average of all the adults			20.90	10.00	3.30	3.00	7.66	37.23

* Young adults.

Comparison of the series and a study of descriptions show clearly that the animals are nearest *R. m. deserti*. Some of the facts of coloration, size, and geographic distribution here presented argue that *klamathensis* should also be regarded as a subspecies of *megalotis*, though intergradation has not been demonstrated.

Distribution.—This harvest mouse was most commonly recorded at Quinn River Crossing (altitude 4100 feet), where twenty-three of the thirty-one specimens were captured. Other localities are Big Creek Ranch (4350 feet), 4; Head of Big Creek (8000 feet), 1; Leonard Creek (6500 feet), 2; and Virgin Valley (5000 feet), 1.

These records of course serve to modify Allen's statement of the geographical distribution of *deserti* (1895a, p. 127) so as to include northern as well as southern Nevada.

The vertical distribution is unusual. The collection of one specimen (no. 8213, male adult) at an altitude of 8000 feet near the head of Big Creek extends the range of the species to a level in the mountains at which white-bark pines were growing. The slope on which this animal was caught faces to the south and east. The sagebrush is its most characteristic plant. This may be an example of a tongue of Sonoran attaining to a greater altitude than usual by virtue of its peculiar exposure. A number of plants and mammals more or less characteristic of the Transition Zone are, however, found at even lower levels on seemingly similar slopes on the east side of the mountains, which would lead to the conclusion that the harvest mouse had here invaded Lower Transition. The range of this form of *Reithrodontomys megalotis deserti* is, then, characteristically the great desert flat from 4100 to 5000 feet in altitude in the upper Sonoran Zone. In smaller numbers the harvest mice invade the mountains where the slope and stream conditions are favorable, possibly even into Lower Transition.

Habits.—Harvest mice were taken in the meadows of the Quinn River Ranch by wild hay tussocks, under sagebrush near the creek at the same locality, in the willows along Big Creek at Big Creek Ranch, on sage-covered hillsides, and on rocky sage flats, the two last mentioned situations being located at an altitude of 6500 feet at Leonard Creek. They were caught at distances ranging from a few feet to sixty feet from the nearest water. Most of the specimens caught at Quinn River Crossing, where they were the most abundant mammal, were taken not far from Wheeler Creek on the sagebrush desert. Their distribution is closely limited to the neighborhood of streams.

Eighteen of the series are males, fifteen females. Seven of the males secured presented greatly developed testes. These were, respectively: no. 8186, May 17; no. 8199, May 20; no. 8201, May 21; nos. 8209 and 8210, June 16; no. 8213, July 26; and no. 8214, August 4. Four of the females contained developing embryos. These were: no. 8192, May 18, 5 embryos; no. 8196, May 19, 4; no. 8204, May 25, 1; no. 8215, August 8, 3. One female, no. 8207, secured May 31, was suckling young. Apparently one pair pectoral, and two pairs abdominal mammae were functional. Six specimens marked "juvenal" were collected: no. 8197 ♀, May 19; no. 8198 ♀, May 20; no 8203 ♀, May 21; no. 8205 ♀, May 26; no. 8206 ♀, May 30; no. 8212 ♂, June 20.

It is evident that the period of gestation lasts for several months, having begun before May 15 and continuing beyond August 10. The seasons of gestation and suckling overlap very markedly. Those living higher in the life-zone become sexually active later than those on the desert flat. The numbers of young, too, according to our observations, vary to some extent.

Neotoma nevadensis Taylor.

Nevada Wood Rat.

Status.—Since the description of this species (Taylor, 1910, p. 289) Dr. C. Hart Merriam has very kindly sent me four wood rat skulls from northern Nevada which are probably referable to it, and in the light of whose characters certain emendations must be made in the diagnosis of the species, especially as regards size of cranium. The four skulls are nos. 78283 ♂, 78284 ♀, and 78287 ♀, all from Deep Hole, southern end of Granite Range, near Smoke Creek Desert, Washoe County, and no. 78289 ♀ from Granite Creek in the same range of mountains. These localities are approximately seventy miles to the south and a little to the west of the type locality of *nevadensis*.

The four skulls from the Biological Survey collection evidently belong to older adults than any of our series, and are shaped precisely as stated for *nevadensis* in the original description. These skulls are slightly larger in all proportions than our series of *desertorum*, and so very definitely larger than the

series of *nevadensis* in the Museum collection. The ratio of the zygomatic width to the length (see table of measurements) is the same in the four as in *desertorum;* while the ratio of the height of cranium at bullae to length of skull is two per cent. greater in the four than in *desertorum.* This was adduced as characteristic of *nevadensis* in the original description. The other ratio, namely that of squamosal width to length, departs from this rule, and is greater than the series of *desertorum* (Taylor, 1910, p. 295), and very appreciably greater than in our series of *nevadensis.*

No differences are apparent between incisors of the Deep Hole and Granite Creek specimens, and *desertorum.* The molars are brown as in a majority of specimens of *nevadensis.* (However, Allen, 1894, p. 243, has shown that this character is not reliable as a species characteristic.)

In order to determine whether the statement given for *nevadensis* (Taylor, 1910, p. 293), concerning the rostrum, namely "rostrum in *nevadensis* relatively longer and more narrow than in *desertorum,*" would hold for the four skulls in question, I took the following measurements.

Comparative Rostral and Cranial Measurements of Four Skulls of *nevadensis* from Deep Hole and Granite Creek, Washoe County, Nevada.

All dimensions are in millimeters.

	Actual length of rostrum*	Total length†	Ratio rostrum to total length
78283	13.7	39.9	34.3
78284	14.0	40.6	34.5
78289	13.7	38.5	35.6
78287	14.0	38.8	36.1
Average	13.85	39.45	35.12

Similar Measurements of *desertorum* from the Mohave Desert, California.

All dimensions are in millimeters.

	Actual length of rostrum*	Total length†	Ratio rostrum to total length
5370	13.2	38.7	34.1
5374	13.9	38.7	35.9
5384	14.1	38.5	36.6
5383	13.1	39.3	33.3
6968	14.7	40.4	36.4
Average	13.80	39.12	35.26

* Measured from anterior end of nasal bones to most posterior point on notch in dorsal anterior root of zygomatic arch.

† Total length = length of cranium, from posterior bulge of brain-case to most anterior part of premaxillary.

These figures prove that the statement above quoted does not hold in the four aged adult specimens.

The tongues of the premaxillaries extending back of the nasals are relatively broader than in *desertorum*, as stated in the description of *nevadensis*.

The hamular processes in the four skulls are very nearly as in *desertorum*.

Two of them (nos. 78284, 78283) show a bay in the dorsal contour of the foramen magnum, the others resembling *desertorum* in this respect.

A tendency seems to exist in the skulls at hand for the presphenoid bar separating the sphenopalatine vacuities to be actually narrower in old age. Even taking this fact into account, and remembering that the four skulls here considered are extremely old specimens, in them the bar seems to be somewhat broader (especially in no. 78287) than in *desertorum*, though the difference is slight.

The mandibles are not less massive in the Deep Hole and Granite Creek series than in *desertorum*. One of the Deep Hole examples (no. 78284) has the bay in the mandible like *desertorum*. Two others (nos. 78283, 78289) have the condition as described for *nevadensis*. The mandible of the other specimen (no. 78287) is broken.

Considerable variation exists in the skulls in respect to anterior roots of zygomata. On the whole they seem to be broader than in *desertorum*. The posterior roots, however, seem to be slightly narrower, even in the larger skulls, which fact harmonizes with the description of *nevadensis*.

The interparietal in the four skulls is similar to that of *desertorum*.

The auditory bullae are more swollen, as adduced for *nevadensis*, as is shown by the measurement "height of cranium at auditory bullae."

In the light of these considerations, the most important cranial characters are, first, the greater ratio of the height of cranium at bullae to length of skull, probably due to bullae being slightly more swollen; second, posteriorly extending tongues of premaxillaries broader; third, posterior roots of zygomatic arches narrower.

CRANIAL MEASUREMENTS OF THE FOUR SKULLS OF *Neotoma occidentalis* FROM DEEP HOLE AND GRANITE CREEK, WASHOE COUNTY, NEVADA.

(Biological Survey Collection, U. S. Department of Agriculture.)

All dimensions are in millimeters.

For method of taking measurements, see Introduction.

Museum No.	Sex	Length*	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Interparietal	Nasals	Diastema	Post-palatal length	Maxillary tooth-row	Height of cranium at bullae	Post-palatal notch to front surface of incisors	Mastoid width	Ratios to greatest length: Zygomatic width	Ratios to greatest length: Mastoid width	Ratios to greatest length: Height of cranium at bullae
78284	♀	40.6	35.2	22.4	5.4	5.0 × 12.0	16.1	11.1	16.6	8.1	14.4	20.4	18.3	55.2	45.1	35.5
78287	♀	38.8	33.1	20.2	5.1	6.0 × 8.4	15.5	11.4	15.3	8.4	13.6	20.0	17.2	52.1	44.4	35.1
78289	♀	38.5	32.9	20.4	5.2	6.2 × 10.5	14.9	10.8	15.1	8.2	13.5	19.5	17.7	53.0	46.0	35.1
78283	♂	39.9	34.9	22.0	5.0	4.7 × 9.7	15.8	11.4	16.4	8.8	.....	20.4	.....	55.1	.....	.....
Average of all the adults		39.45	34.02	21.25	5.17	5.47×10.15	15.57	11.17	15.85	8.37	13.83	20.07	17.73	53.85	45.16	35.23

* Measured from posterior bulge of brain-case to most anterior point of premaxillary.

The examination of these four skulls shows the number of the distinguishing cranial characters to be considerably less than at first supposed. They show a very decided approach to *desertorum*, this being what might be expected to occur. It is possible that the disposition of the form *nevadensis* as a subspecies of *desertorum* would more correctly represent the status of the Nevada wood rat; but this is hardly justifiable without an examination of more material, including skins.

There is now available in the Museum collection a series of *Neotoma desertorum* from the Colorado River, collected on the California side by the Colorado River Expedition (Mus. Vert. Zool.) of 1910. This series contains animals of various ages, and a comparison with the topotype series of *nevadensis* brings to light the following facts.

Specimens absolutely comparable, as regards age, were selected. Characters used in determining age were largely cranial, the most important being the degree of development, emergence and wear of the teeth.

The series as a whole presents characters indicating the distinctness of *nevadensis*. The posteriorly extending tongues of the premaxillaries, for example, are narrower than in *nevadensis*, and the zygomatic arches are more widely spreading. The rostra of the series of *desertorum* from the Colorado River are shorter and broader than in *nevadensis*. The anterior roots of the zygomatic arches are on the average wider in the series of *desertorum*; the hamular processes are more curved, on the average, and the incisors show differences as outlined in the description of *nevadensis*, being longer and less curved in *desertorum*. Only one of the comparable series of *desertorum* (no. 10424) has the bay in the dorsal contour of the foramen magnum as sharply defined as in *nevadensis*. While there is no appreciable difference in weight in the mandibles of the two series, and although it is impossible to say, as a result of this comparison, that the posterior roots of the zygomatic arches are different, still the majority of skull characters clearly points to the distinctness of the Nevada wood rat.

Measurements of *Neotoma desertorum* From the California Side of the Colorado River.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Locality	Total length	Tail vertebrae	Hind foot
10440	♂	20 miles above Picacho	273	137	31
10424	♂	Opposite the Needles	298	140	30
10437	♂	20 miles above Picacho	225	115	30
10438	♂	20 miles above Picacho	295	138	30
10451	♂	Near Pilot Knob	275	120	30
10429	♀	Opposite Cibola	286	137	29
		Average of all the adults	275.3	131.1	30.0
		Average of *Neotoma nevadensis*	257.6	111.7	30.3

Upon looking over the skins of the two series, differences are even more clearly apparent. *Nevadensis* is shown to be a good shade darker than *desertorum*. The entire series of the latter averages lighter, and this holds for very young ones as well as for adults. As regards coloration of dorsal tail surface only one specimen of *desertorum* (no. 10437) has the very black dorsal tail surface characteristic of *nevadensis*. As for dimensions (see table of measurements), comparable *desertorum* from the Colorado River averages 17 millimeters longer as regards total length (7 per cent. greater), and 19 millimeters longer tail vertebrae (17 per cent. greater). These differences are not inconsiderable.

The characters as a whole, taking into account cranial characters, coloration, and difference in size seem to be significantly correlated, and indicate that Goldman (1910, p. 76) is not justified in relegating *nevadensis* to synonymy.

Distribution.—*Neotoma nevadensis* probably ranges over a considerable portion of the northern part of the Great Basin Region in Nevada. The Washoe County specimens, although not typical, would appear to extend its range westward and southward.

Habits.—The sagebrush is the characteristic plant of the region inhabited by this wood rat. The fact that there are few rocks except on the scattering buttes and in the mountains may be one reason for its rarity. However, it must live at least to some extent in burrows in the open; for one juvenal was caught at Quinn River Crossing far from rocks of any kind, nor were

there any nests in the immediate vicinity. The species evidently prefers rocky situations.

Signs of wood rats were observed in several places in the foothills of the Pine Forest Mountains near Big Creek Ranch. What was apparently an occupied nest was found built along the side and on top of a large cracked rock in the side of a small ravine a hundred feet above the desert flat. Burro and cow-dung, and dead sage branches were incorporated into the structure. The nest proper was made of fine dry grasses. Fresh scatological material was seen, but none of the animals could be frightened out. A nest discovered near Quinn River Crossing was built to a height of three feet in a large dead bush, coarse sticks and cow-dung being used in its construction. Trapping in the vicinity failed to show the presence of any tenants. Several nests built of the usual materials were noted in the outcroppings of igneous rock on a ridge near Alder Creek Ranch.

Locally the preferences of this wood rat and the golden-mantled ground squirrel seem to be somewhat similar in respect to habitat. Both were caught in rocks on top of a ridge (altitude 5000 feet), near Big Creek Ranch.

Neotoma cinerea occidentalis Baird.

Western Bushy-tailed Wood Rat.

Status.—The two specimens of bushy-tailed wood rat secured (nos. 7892, 7893) were submitted to Dr. C. Hart Merriam for identification. He marks them "*occidentalis* (not typical)," stating that they vary in the direction of *Neotoma cinerea cinerea*.

Two specimens of *cinerea* are in the Museum collection, no. 3743, adult male, collected by Frank Stephens at Anthony, Oregon, and the other, no. 3328, adult female, collected by A. S. Bunnell on Mount Shasta. The Oregon animal was collected in October. It is darker than the Mount Shasta specimen, secured August 5, and is probably in the winter pelage. The adult Nevada specimen differs from these in that it is paler and is suffused with a lighter shade of brownish yellow on sides and back, and presents a bluer white on the lower parts. In size it corresponds fairly well with the average of *cinerea* as exemplified by the two specimens at hand.

Baird, in the original description of *occidentalis* (1855, p. 335) gives the length of the head and body as 10 inches (= 253.9 mm.) and length of tail vertebrae 8 5/12 inches (or about 213 mm.). The single adult animal from the Pine Forest Mountains has a length of 207 and 170 mm., respectively, for the corresponding parts. Evidently our animal is smaller than the type of *occidentalis*, approaching the measurements given by Elliot in his Synopsis (1901, p. 163), which are: total length, 387 mm.; tail vertebrae, 165; hind foot, 42; ear, 31.5. The average measurements of the two examples from the Museum collection are respectively as follows: total length, 368 mm.; tail vertebrae, 161; hind foot, 43; and ear, 30.5. The adult from Nevada measures 377, 170, 41, and 27 (ear measured in dry skin, notch to tip). The young animal has the posterior part of the sole of the hind foot furred, the fur in the adult extending a much shorter distance onto the sole.

The juvenal differs from the adult in the possession of smaller dimensions (total length, 329, tail vertebrae, 148; hind foot, 45), in much less bushy tail, the hair being short, in softer, shorter hair dorsally, with more of a bluish coloration (the yellowish brown hardly shows except on the upper side of the forelegs, and posteriorly along the sides), and in the coloration of the tail, which is gray dorsally, edged with white, instead of brownish plumbeous.

Distribution.—The adult female was collected July 16, at an altitude of 6000 feet on Alder Creek; and the male juvenal (no. 7892), at 6500 feet altitude on Leonard Creek, August 5.

The present records are from a locality on the extreme margin of the range of *occidentalis* (Goldman, 1910, p. 96) and it might be expected that the characters of the specimens, although nearer those of *occidentalis*, would not be absolutely typical of either species, and such is the case.

The localities at which wood rats were taken by our party were hardly above the Upper Sonoran life-zone, or if in Transition, only at the lowermost level of it.

Habits.—We trapped very thoroughly for these wood rats on rocky ridges of the higher parts of the range, but our efforts were in every case attended with failure. What was our sur-

prise when working over a large rocky outcrop at an altitude of only 6000 feet on Alder Creek to discover in one of our traps an adult female western bushy-tailed wood rat! The outcrop was not far from the stream, and it is certain that tongues of the Transition zone run down along the creek; but it was in a peculiarly exposed position, and surrounded by no vegetation except the almost omnipresent *Artemisia tridentata*. Our desire to get more of the animals was not realized until we put out a line of traps in a rocky outcrop on Leonard Creek very similar to the one on Alder Creek and at about the same elevation. Why these wood rats should be living at such low levels is difficult to explain, for many rock-piles, and of a nature entirely suitable, so far as we could determine, exist at greater altitudes in the mountains. There is evidently some factor not as yet understood which influences their distribution.

The taking of the juvenal on August 5 would indicate that the young are born in early summer. The adult female showed by the condition of the mammae, of which there were two abdominal pairs, that she had recently suckled young.

These animals live in crevices in the rocks, like many species of round-tailed wood rats.

Microtus mordax (C. H. Merriam).

Cantankerous Meadow Mouse.

Status.—The series of meadow mice taken by the Nevada Expedition in the Pine Forest Mountains has been referred to this species by Bailey.

Distribution.—Runways which were immediately set down in our note books as those of *Microtus* were observed at Quinn River Ranch (altitude 4100 feet). However, assiduous trapping failed to reveal the presence of the animals, though conditions apparently could not have been more favorable. On June 15 a specimen (no. 7982) was caught in a grassy location beneath some willows near the stream at Big Creek Ranch (4350 feet). The series was taken for the most part at the head of Big Creek (8000 feet). On August 1 the species was also recorded at the

Measurements of *Microtus mordax*, All From the Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Locality	External			Cranial					Ratio, hind foot to tail vertebrae
			Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Nasals	Zygomatic width	Mastoid width	Maxillary tooth-row	
7974	♂	Head of Big Creek	162	61	19	22.5	7.0	14.1	11.9	6.2	31.1
7975	♂	Head of Big Creek	168	63	22	23.4	7.2	13.9	11.9	6.3	34.9
7977	♂	Head of Big Creek	155	57	20	22.1	7.3	13.3	11.4	6.1	35.1
7978	♂	Head of Big Creek	171	61	22	23.8	8.1	14.7	12.3	6.0	36.1
7981	♂	Leonard Creek	159	60	21	21.0	7.1	13.3	10.9	6.2	35.0
7982	♂	Big Creek Ranch*	177	67	21	.....	.....	.....	.....	.....	31.3
7976	♀	Head of Big Creek	156	57	19	21.2	6.5	.....	10.9	5.9	33.3
7979	♀	Head of Big Creek	163	63	20	22.5	7.3	.....	11.9	6.0	31.7
7980	♀	Meadow, Duffer Pk.	165	57	22	.....	7.1	14.2	.....	6.4	38.6
		Average of the males	165.3	61.6	20.8	22.56	7.34	13.86	11.68	6.16	33.91
		Average of the females	161.3	59.0	20.3	21.85	6.96	14.20	11.40	6.10	34.53
		Average of all the adults	164.0	60.6	20.6	22.35	7.20	13.91	11.60	6.13	34.12

* Big Creek Ranch is on the plain near the mountains, but is at a considerably less altitude than the other localities mentioned.

Duffer Peak meadow (8400 feet), and six days later on Leonard Creek (6500 feet).

The species has been recorded from the Pine Forest Range before (see Bailey, 1900, p. 50).

Habits.—The meadow mice were in no case caught at any distance from streams, ordinarily only a few feet therefrom. They were fairly common at the head of Big Creek. The fact that there was more vegetation there than at other localities in the mountains visited may have had something to do with this. Several were seen from time to time along the stream during the day, so they are by no means entirely nocturnal. Under such circumstances they kept well within the vegetation at the water's edge.

From the discovery of freshly cut grasses near the points of capture of *Microtus*, it may be safely concluded that grass is one item in their diet. The specimen secured on the Duffer Peak meadow was caught near a small burrow in a damp meadow near a stream.

Of the specimens taken six were males, three females. Every one, as was indicated by the condition of the reproductive organs, was sexually mature. All six of the males had the testes enlarged, and all three of the females contained embryos. Exact data follow: No. 7976, July 1, 8 embryos; no. 7979, July 23, 5 embryos; no. 7980, August 1, 6 embryos. The first two were secured at the head of Big Creek (altitude 8000 feet); the last one at the Duffer Peak meadow (altitude 8400 feet). Evidently the time from June to August falls in the period of gestation.

Microtus (Lagurus) intermedius, new species.

Intermediate Short-tailed Meadow Mouse.

Type.—Male, adult; no. 7973, Univ. Calif. Mus. Vert. Zool.; head of Big Creek (altitude 8000 feet), Pine Forest Mountains, Humboldt County, Nevada, July 1, 1909; C. H. Richardson, Jr., and W. P. Taylor; original no. 3082.

Diagnostic Characters.—Slightly larger than *pauperrimus,* but much paler; smaller than *curtatus.*

Status.—Upon examining the series of six specimens of short-tailed *Microtus* taken in the Pine Forest Mountains, it was immediately apparent that their characters were not exactly those of any one of the three described North American species. I have at hand at the present writing topotypes of these species, namely *Microtus pallidus* C. H. Merriam, *Microtus curtatus* (Cope), and *Microtus pauperrimus* (Cooper). The type localities are respectively, of *pallidus,* Fort Buford, North Dakota; of *curtatus,* Mount Magruder, Nevada; and of *pauperrimus,* the plains of the Columbia River in Oregon. I have access to these specimens through the kindness of Dr. C. Hart Merriam.

Compared with topotypes, or near topotypes, of *pauperrimus* (nos. 78534, 78535, Biol. Surv. Coll.) from Antelope, Oregon, June 21, 1896, it is immediately apparent that our series is much paler, and cannot possibly be referred to that form. Our animals were trapped June 25 to July 1, and, with the possible exception of one specimen (no. 7972), are fully adult. There is, in *intermedius* as compared with *pauperrimus,* relatively more difference between the dorsal coloration and that of the sides.

Ears and face of *intermedius* are very much paler. In *pauperrimus* these parts are brown. The majority of our series have silvery white coloration ventrally, while the two topotypes of *pauperrimus* have the underparts pale buffy (suffused in no. 78535; suggested in no. 78534). Two females of *intermedius* (nos. 7968, 7972) have a very slight wash ventrally of the palest possible buffy.

Although external measurements are much the same, the advantage in the matter of average size lies with *intermedius*. The type specimen (no. 7973) is the only one of our series having a hind foot measuring 18 millimeters. The measurement in the dry skin is 16.8, and I am inclined to think the recorded measurement a little too large.

The skulls of *intermedius*, with the exception of that of no. 7973, which is flat-topped, present a slight concavity postorbitally very similar to *pauperrimus*. With the exception of the zygomatic breadth the skulls of *intermedius* are slightly larger than that of an adult female *pauperrimus* figured by Bailey (1900, p. 70). On the same page of his Revision, Bailey calls attention to the fact that a single specimen of supposed *pauperrimus* from the top of Steen Mountain, Harney County, Oregon, is not typical. This specimen is now before me. It is a female (no. 79917) taken July 24, 1896, by C. H. Merriam and Bailey. It measures, total length, 121 mm.; tail vertebrae, 24; hind foot, 18. Thus in dimensions this specimen is almost identical with the average for *intermedius*. It has the lower parts white, with a slight wash of buffy, more as in *pauperrimus*. It also exhibits the brownish dorsal coloration which at once distinguishes *pauperrimus* from *intermedius*. The face and ears are distinctly brownish, unlike the Nevada specimens. The Steen Mountain animal is also somewhat paler than the two examples of *pauperrimus* from Antelope; but whether this is significant of an intermediate condition may be doubted, for no. 79917 has evidently assumed the post-breeding pelage, which is full and long. The topotypes are still in the breeding dress, which is worn so that the plumbeous bases of the hairs show through both dorsally and ventrally. However, this aberrant specimen (no. 79917), although nearer *pauperrimus*, does very clearly show characters somewhat intermediate between

those of that species and *intermedius*, resembling the former in coloration, the latter in size.

Measurements of *Microtus* (*Lagurus*) *intermedius* From the Head of Big Creek (Altitude 8000 Ft.), Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

			External			Cranial					
Museum No.	Sex		Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Nasals	Zygomatic width	Mastoid width	Maxillary tooth-row	Height of cranium at bullae
7969	♂		127	26	17	.....	.....	.....	.....	.....	.....
7973	♂		120	24	18	.....	6.2	13.8	.....	5.4	.....
7971	♂		115	26	16	.....	5.8	12.3	.....	5.5	.....
7970	♂		126	30	14	21.9	.....	14.3	12.2	6.2	8.8
7968	♀		.....	27	17	.....	5.7	.....	.....	.....	.....
7972	♀		117	22	17	20.0	6.4	12.9	11.4	5.8	8.4
Average of all the adults			121.0	25.8	16.5	20.9	6.0	13.3	11.8	5.7	8.6

Measurements of Topotypes of Three Species of *Microtus* (*Lagurus*).

				External			Cranial					
Museum No.	Sex	Species		Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Nasals	Zygomatic width	Mastoid width	Maxillary tooth-row	Height of cranium at bullae
78535	♀	*Microtus pauperrimus*		.....	....	....	20.0	5.4	12.7	11.0	5.5	8.3
78534	♀	*Microtus pauperrimus*		114	21	16	19.4	5.4	13.2	11.1	5.5	8.2
79917	♀	*Microtus pauperrimus*		121	24	18	20.7	6.2	13.2	11.4	5.7	8.2
		Average of *Microtus pauperrimus*		117.5	22.5	17	20.0	5.6	13.0	11.1	5.5	8.2
110803	♀	*Microtus pallidus*		129	22	18.5	22.0	6.4	14.4	12.0	6.3	8.4
40445 } 28341 }	♂	*Microtus curtatus*		137	24	17	22.4	6.3	14.6	12.8	6.0	9.1
		Average of *Microtus intermedius*		121.0	25.8	16.5	20.0	6.0	13.3	11.8	5.7	8.6

From *curtatus* (of which an adult male topotype from Mt. Magruder, Nevada, no. 28341, June 7, 1891, Merriam and Bailey, is at hand) *intermedius* is differentiated by smaller size, except as regards length of tail; ears not buffy, except in one specimen (no. 7972); slightly darker dorsally, this being due to the in-

sprinkling of hairs which are black rather than dark brown. *Intermedius* may be said to be grayish, while *curtatus* is light brownish. Face of *intermedius* gray; that of *curtatus* brown. No. 28341 has begun to assume the post-breeding pelage, the molt proceeding medially, and having appeared as yet only on the head. In general the two species are similar in coloration, but *intermedius* is definitely smaller, especially in cranial measurements, in which the difference in size is relatively great. The auditory bullae are smaller, relatively and actually, the rostrum and incisors are narrower, the jugal is not so wide; the anterior expansion of the zygomatic arch is not as extensive, and the infraorbital foramen is smaller. Although in general the two skulls are much alike in shape, skulls of *intermedius* are not so definitely concave post-orbitally; notch enclosed by the hamular or coronoid of the mandible not so rounded as in *curtatus* but more as in *pallidus;* neck of articular process of mandible not so constricted; angular process slightly more scooped out internally.

Microtus intermedius is so different from *pallidus* as hardly to necessitate comparison. A specimen of the latter (no. 110803, female, Glenullin, North Dakota, Sept. 12, 1901, W. H. Osgood) is at hand. It is assuming the winter pelage, which covers the face and top of the head and is gradually encroaching on the back along the median line. The new pelage is much darker than that which is being replaced. *Intermedius* is readily distinguished from *pallidus* by a lack of buffy on the ears and nose, which is a conspicuous feature in that form. *Pallidus*, at least as exemplified by the specimen at hand, instead of being the palest of the species of *Microtus* of the subgenus *Lagurus* (see Bailey, 1900, p. 68) is exceeded in this respect by both the available specimen of *curtatus* (no. 28341) and all our specimens of the new species. At the present state of knowledge, the distinction of being in general the palest of the species must be accorded *intermedius*. The new form is smaller than *pallidus* except in the matter of tail length. The skull is also perceptibly smaller, having rostrum more narrow, though the auditory bullae are slightly larger.

Distribution.—Although extensive trapping was carried on at several points in the Transition zone of the Pine Forest

Mountains, *Microtus intermedius* was found only at the head of Big Creek, altitude 8000 feet. Thus the distribution of the species so far as known is a limited area in the Transition of the Pine Forest Mountains, Humboldt County, Nevada.

Habits.—The area in which the intermediate short-tailed meadow mice were caught is a north-facing slope at the head of Big Creek. It is a dry, treeless place, covered with sagebrush. The mice were caught only in the sage, on dry ground, but ranged from near the stream several hundred feet up the side of the ridge south of it. Most of those captured were secured near small holes; and on the slope itself several were caught near and under rocks, under which were small burrows. On one occasion two animals, both adult males, were caught, the first on June 26, the second June 27, in front of the same little hole on the hillside. This may show that more than one family live in a burrow. The animals were comparatively common. It is peculiar that none were found at any other point in the mountains, though trapping was done elsewhere on sage slopes as favorable to all appearances as the one in question. There were white-bark pine trees on the same side of the ridge below the level at which the meadow mice were caught.

Of the six specimens secured, four are males, two females. Two of the former (nos. 7969, 7973, trapped June 26 and July 1, respectively) showed signs of sexual activity, and one of the latter (no. 7968), caught June 25, 1909, contained five embryos almost ready to be born. Since only three of the six show any indications of sexual activity, it seems that Bailey's observation (1900, p. 6) that meadow mice have no definite breeding period is confirmed for *Microtus intermedius*, though not for *Microtus mordax* (see p. 253).

Status.—The form *intermedius* is so well characterized as to deserve specific designation. Characters of this species and those previously described show all of them, however, to be rather closely related. The new species is intermediate in several respects between *pauperrimus* and *curtatus*. It might be argued that it should be regarded as a subspecies on any other ground than that of the arbitrary criterion of intergradation. But of which of the older known species should it be called a subspecies?

In the present state of our knowledge of the mammalogy of the Great Basin the present disposition seems to be the most appropriate, since it is impossible with the data at hand to determine definitely its relation to any of the neighboring species.

Thomomys fuscus fisheri (C. H. Merriam).

Fisher Pocket Gopher.

Status.—A comparison of our gophers with a series of six specimens of *fisheri* from the collection of the United States Biological Survey, four being topotypes from Beckwith, Sierra Valley, Plumas County, California, and two being specimens taken at Reno, Nevada, shows them to be this form. In his description of the subspecies Merriam (1901, p. 111) gives the following average measurements of six specimens from the type locality: total length, 192 mm.; tail vertebrae, 58; hind foot, 25. It will be seen from the appended table that our animals vary little from these figures.

The series collected by us was captured during June and July. The specimens at hand from Beckwith and Reno are August and October animals. All the adult specimens taken by our Expedition show definite molt lines. In two of them (nos. 7848, 7852) the molt is about half completed, while in three others (nos. 7850, 7851, 7853) it is three-quarters done. These last were taken in July, the first two in June and early in July respectively. The Biological Survey specimens, with the exception of three (nos. 101240, 101245, 134853) have the new pelage complete. The two series are much the same in color, the only apparent difference being in the color of the throat, which is pure white in the specimens from Beckwith and Reno, and light gray in the Pine Forest Mountain series. There is a possibility, however, that this color in the latter is due to the soil in which they live, or to a difference in pelage progress. The last is the most probable explanation, as the hair on the throat of each Pine Forest Mountain example is thinner and shorter than that on the topotypes. Over against this, however, is the fact that on the Beckwith and Reno animals the entire hair on the throat is white, having no gray or plumbeous base, and so apparently

could not be reduced by wear to the conditions shown by our specimens.

No greater discrepancies are presented in skull size and shape than would be expected as a result of individual variation.

EXTERNAL MEASUREMENTS* OF *Thomomys fuscus fisheri* FROM THE PINE FOREST MOUNTAINS, HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length.	Ratio, hind foot to total length
7848	♂	206	64	26	31.0	12.60
7852	♂	206	63	26	30.6	12.60
7853	♀	181	59	24	32.6	13.25
7850	♀	193	58	25	31.0	12.95
Average of the males		206.0	63.5	26.0	30.8	12.60
Average of the females		187.0	58.5	24.5	31.8	13.10
Average of all the adults		196.5	61.0	25.2	31.3	12.85

* In the nature of the case too much emphasis should not be laid on these measurements, as the examination of larger series might give substantially different results. An examination of the skulls shows no. 7853 to be the youngest specimen the measurements of which are here tabulated. Even this individual is sexually mature, as the uterus contained six fetuses.

DISTRIBUTION.—With the exception of the one specimen mentioned (no. 7853), which was taken at the head of Big Creek at an altitude of 8000 feet, all of our series of six individuals were secured on a meadow on Big Creek (altitude 7000 feet). Apparently this is an isolated colony of Fisher pocket gophers.

Our records result in a considerable extension of the known range of this species, which will doubtless with further work be found elsewhere in the western part of the Great Basin. Life-zones represented are high Upper Sonoran and Transition.

HABITS.—Old workings, but no fresh ones, were noted on meadows on the west slope of the mountains. Fresh workings were observed at 8500 feet near Duffer Peak, on the meadow in which Leonard Creek heads (8000 feet), and at an elevation of 7500 feet on the same stream. A few fresh workings were observed in very dry soil under sagebrush near the forks of Big Creek, elevation 5800 feet. Their small size and the character

CRANIAL MEASUREMENTS OF *Thomomys fuscus fisheri* FROM HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Length*	Basilar length of Hensel	Zygomatic width	Mastoid width	Interorbital constriction	Interparietal	Nasals	Diastema	Post palatal length	Maxillary tooth-row	Height of cranium above palate	Height of cranium above basion	Ratio to greatest length of skull: Zygomatic width	Ratio to greatest length of skull: Mastoid width	Ratio to greatest length of skull: Height of cranium above palate
7848	♂	36.4	32.3	22.6	19.1	6.1	4.3 ×7.6	.....	13.1	10.9	7.1	13.7	10.3	62.0	52.5	37.6
7852	♂	35.7	31.9	22.1	19.2	5.6	4.7 ×7.4	13.0	12.7	11.5	7.2	13.9	10.6	61.9	53.8	38.9
7850	♀	33.1	29.4	20.1	16.5	6.4	4.4 ×6.7	11.5	10.8	10.9	7.2	12.7	9.5	60.7	49.8	38.5
7851	♀	33.0	28.9	19.8	16.9	6.2	3.9 ×6.8	12.3	10.7	10.0	7.5	12.8	9.7	60.0	51.2	38.8
7853	♀	32.4	28.4	20.1	17.2	6.4	4.4 ×7.2	12.3	10.3	10.1	6.9	12.8	9.5	62.0	53.1	39.5
Average of the males		36.05	32.10	22.35	19.15	5.85	4.50×7.50	.....	12.90	11.20	7.15	13.80	10.45	61.95	53.15	38.25
Average of the females		32.83	28.90	20.00	16.86	6.33	4.23×6.90	12.03	10.60	10.33	7.20	12.76	9.56	60.90	51.36	38.93
Average of all the adults		34.12	30.18	20.94	17.78	6.14	4.34×7.14	12.27	11.52	10.68	7.18	13.18	9.92	61.32	52.08	38.66

* Measured from occipital condyles to most anterior part of premaxillary.

of the soil in which they were found would indicate that they were made by *fisheri*.

All the adults showed unmistakable signs that mating had taken place some time before. A male juvenal of the year was caught July 5. A female secured July 24 (no. 7853) contained six embryos.

The gopher of the flat, *Thomomys nevadensis*, was observed for the most part in loose soil; but equal numbers of workings of the mountain species were recorded in very hard dry soil and soft damp earth. The hardness of the soil seemed not to have so much influence on the distribution of this gopher as some other factor, probably the location of food plants. No workings of *fisheri* more than twenty-five yards from water were seen. *Nevadensis* seems to be confined even more closely to moist earth, and consequently its distribution is more immediately dependent on the location of streams.

The only clue obtained to the exact food of *fisheri* was the fact that the cheek-pouch of one of the specimens captured contained the head of some composite flower and a small green stem.

One example may be cited as showing how these little gophers progress underground. Five mounds were noted arranged in a slightly curved line, about three feet apart, and all about the same size, namely, eight inches to a foot in diameter. The mound at one end was quite new, that at the opposite end being the oldest. A juvenal gopher was caught in the part of the burrow leading to the freshest mound. The animal had moved underground in a given direction, coming to the surface and throwing out earth at definite intervals.

In many instances it is difficult to locate open burrows in the workings, as this gopher packs the exits very solidly full of earth. Evidences of the former presence of gophers were observed on several high meadows, where tubes of mud, built through the snow when it lay heavy on the ground in winter and left behind when it melted, were not infrequently seen. Their activity does not appear to be inhibited wholly by cold weather. For some reason, possibly disease or increase of enemies, the species seems to be much less abundant at present than it was a few years ago. Among enemies whose increase

may be responsible for the diminution in numbers of gophers the two species of weasels, *Putorius arizonensis* and *Putorius cicognani*, should be mentioned. It is not improbable that the larger weasel can handle a gopher of almost any size, while the smaller species may prey upon the young ones. It is impossible, however, to state with certainty the exact cause of the apparent dying-out of the species on the western side of the mountains and on many of the high meadows.

Thomomys nevadensis C. H. Merriam.

Nevada Pocket Gopher.

Status.—All the specimens secured exhibit the lighter or buffy-gray phase of coloration, called by C. Hart Merriam (1897b, p. 213) the "normal" pelage. The dark color around the mouth varies from dusky to a burnt sienna or chestnut. The fur of the throat is white, the patch varying in extent in different specimens. One example (no. 7860) has a white spot in the mid-pectoral region. In certain old specimens (nos. 7856 and 7863) the buffy white ends of the hairs of the underparts have worn off, leaving the plumbeous under-fur most in evidence. In no. 7856, too, the dorsal surface is very patchy in appearance, due to the same cause. In some places the hair is so thin as to leave the skin exposed.

Four juvenals (nos. 7858, 7861, 7862, 7865) may be described as follows: Upperparts uniformly buffy-gray, the gray predominating over the buff; lighter dorsally than the adults; underparts white, the plumbeous bases of the hairs showing through; a very slight tinge of buffy is shown by one specimen (no. 7862); throat pure white; around fore-legs and along sides of neck buffy; dusky around the mouth; fore and hind feet and tail whitish; ear and small post-auricular area prominently dusky. Juvenals may be distinguished from adults by the difference in the character of the pelage, that of the young ones being made up of much finer hairs than that of the adults. There are comparatively more of the long hispid hairs on the young ones, though this is not a sure criterion in my experience. One very young juvenal (no. 7865) presents some marked variations in

color; namely there is a predominance of slate dorsally, which blends posteriorly into the "normal" buffy-gray. This specimen has also much more of a buffy tinge on the sides of the neck and posteriorly than the other juvenals examined. An older juvenal (no. 7869) is apparently molting from the lighter juvenal pelage into the darker adult pelage, as a distinct molt-line is evident running transversely across the dorsal surface in the region of the ears and another line, rather indistinct, running irregularly across the ventral surface about half-way back. Anterior to these molt-lines the buff pelage predominates.

A number of adults, too, show definite molt-lines, which can be followed on the back of the gopher but are often indistinguishable on the breast and belly. In general the molt proceeds more rapidly on the back than on the sides. One example (no. 7859) exhibits three distinct molt-lines, two of them in the middle of the back about an inch apart, the other two inches anterior of the tail. These observations seem to show that, whereas, generally the hair starts to be renewed at the nose and the molting process works backward toward the tail, in some cases there are two

TABLE OF EXTERNAL MEASUREMENTS OF ELEVEN ADULT SPECIMENS OF *Thomomys nevadensis* FROM HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
7856	♂	264	84	38	31.80	14.40
7859	♂	261	82	36	31.40	13.80
7860	♀	240	73	36	30.40	15.00
7868	♀	267	90	36	33.70	13.50
7854	♀	244	87	34	35.60	13.80
7864	♀	250	86	33	34.40	13.20
7870	♀	255	80	37	31.35	14.50
7866	♀	257	85	35	33.10	13.60
7855	♀	262	81	35	30.90	13.35
7857	♀	.....	...	36	.....	.....
7867	♀	251	85	35	33.80	13.95
Average of the males		262.5	83	37	31.65	14.10
Average of the females		253.2	83.3	35.2	32.92	13.86
Average of all the adults		255.1	83.3	35.5	32.64	13.91

centers of molt inception, one at the anterior end of the animal, the other in the mid-posterior region. From the anterior end, the molt of course works backward, from the mid-posterior region it works both backward and forward.

The results of my study of the material at hand agree closely with the characterization of the skull of the species as given by C. Hart Merriam (1897b, p. 213). In our specimens the premaxillae extend variously from 1.7 mm. in young specimens, to 3 mm. in two adults. The average length of these bones posterior of a line joining the posterior ends of the nasals in fourteen skulls at hand is 2.3 mm. The average of all the juvenals taken separately is 2.04 mm., that of the adults 2.48 mm. The jugals, while essentially parallel, converge slightly anteriorly, except in one specimen.

There is great variation in the size and shape of the interparietal, as the table of measurements shows. In one old specimen (no. 7856) it has the form of a triangle pulled out anteriorly and posteriorly as a result of the approach of the temporal ridges; in a juvenal (no. 7869), it is square. Although it is trapezoidal in form in most of the skulls examined its great variation in outline may be illustrated by the fact that in one it is pentagonal, in another arrow-head shaped. In general it may be said to be approximately square in the young specimens, growing smaller and taking on a more triangular form with age, due to the growth of the parietal bones. This reduction in size is, according to C. H. Merriam (1895a, pp. 41, 62), due to two causes, namely, the partial covering of it by the parietals, and its resorption as a result of pressure along the suture between it and the parietals.

TABLE OF CRANIAL MEASUREMENTS OF *Thomomys nevadensis* FROM HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex and age	Length*	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Interparietal	Nasals	Diastema	Post-palatal length	Maxillary tooth-row	Height of cranium above palate	Antero-basicranial length†	Height of cranium above basion	Mastoid width	Ratios to length: Zygomatic width	Ratios to length: Mastoid width	Ratios to length: Height of cranium above palate
7856	♂ ad.	46.6	41.9	32.0	7.4	7.4 ×3.3	17.7	18.2	12.8	9.6	19.1	32.8	12.8	26.2	68.60	56.2	41.00
7859	♂ ad.	44.8	39.5	29.7	6.9	4.5 ×5.3	15.9	16.6	12.3	8.9	17.8	30.5	12.7	24.7	66.20	55.1	39.70
7870	♀♀ ad.	43.6	40.0	31.0	7.7	4.6 ×5.3	15.5	16.7	12.4	9.2	17.7	30.7	12.6	25.2	71.10	57.8	40.60
7868	♀ ad.	46.0	41.2	31.2	7.6	4.2 ×5.6	16.1	17.0	13.0	9.7	18.0	31.8	13.5	25.3	67.80	55.0	39.18
7855	♀ ad.	44.2	39.4	30.4	7.4	5.1 ×4.8	15.8	16.2	12.5	9.7	17.8	30.9	12.0	25.0	68.70	56.5	40.30
7864	♀ ad.	42.6	37.9	28.2	6.9	4.9 ×5.4	14.9	15.0	12.3	9.5	17.1	29.0	12.2	23.5	66.25	55.2	40.10
7857	♀ ad.	43.1	37.9	28.5	7.0	5.0 ×5.0	15.5	15.4	12.4	8.9	16.9	28.8	12.0	23.8	66.10	55.2	39.20
7854	♀ ad.	42.6	37.8	29.1	7.1	4.5 ×5.5	15.4	14.8	11.9	9.1	17.3	28.4	12.0	24.2	68.25	56.8	40.60
7860	♀ ad.	44.0	39.1	29.5	6.6	4.3 ×3.0	16.4	16.2	12.6	9.4	17.6	30.3	13.3	24.7	67.00	56.1	40.00
7867	♀ ad.	43.6	39.1	28.7	6.8	5.0 ×5.3	15.5	16.0	12.6	9.3	17.5	29.6	11.9	22.0	65.80	50.4	40.20
7866	♀ ad.	44.0	39.5	29.7	7.2	5.0 ×2.9	14.5	15.8	12.5	9.4	17.5	30.4	12.8	24.2	67.50	55.0	39.80
7862	♂ juv.	37.0	32.8	.....	7.2	4.7 ×5.6	12.0	12.6	10.3	7.2	15.0	24.6	11.2	20.5	.....	55.4	40.60
7865	♀♀ juv.	32.6	28.5	.....	7.7	4.4 ×5.1	10.7	10.0	9.3	7.8	12.9	21.1	10.0	18.9	.....	57.9	39.60
7858	♀ juv.	34.9	30.8	.....	7.0	4.6 ×5.0	11.9	11.8	9.7	7.2	14.3	23.2	10.8	19.8	.....	56.7	41.00
7861	♀ juv.	.....	.....	.....	7.2	4.6 ×6.6	12.7	12.0	.....	7.4	14.8	24.1	.....	.....	.....	.....	.....
7869	♂ juv.	41.0	36.8	27.5	7.6	4.6 ×4.6	13.7	14.9	11.7	7.6	16.9	28.5	13.1	23.8	67.10	58.0	41.25
Average of the males‡		45.70	40.70	30.85	7.15	5.95×4.30	16.80	17.40	12.55	9.25	18.45	31.65	12.75	25.45	67.40	55.65	40.35
Average of the females		43.74	39.10	29.50	7.14	4.73×4.75	15.51	15.90	12.46	9.35	17.48	29.98	12.47	24.21	67.61	55.33	39.99
Average of all the adults		44.10	39.39	29.81	7.14	4.95×4.67	15.74	16.17	12.48	9.33	17.66	30.29	12.52	24.43	67.57	55.39	40.06

* Measured from occipital condyle to most anterior point of premaxillary.

† Measured from post-palatal notch to posterior margin alveolus of middle incisor.

‡ In the averages as listed no account is taken of the juvenals, even though these are entered in the table.

Distribution.—Workings of the Nevada gopher were seen near Winnemucca, on the flat west of Amos, in an alfalfa field on Chimney Creek (Santa Rosa Mountains), at Alder Creek and Big Creek ranches (Pine Forest Mountains), and at Quinn River Crossing. Fourteen were trapped at the latter locality, and three at Big Creek Ranch. Gopher workings were seen at intervals along the course of the stream from the ranch up into the mountains. It is not certain just where the dividing line lies between *nevadensis* and *fuscus fisheri*. *Nevadensis* is, however, typically a species of the desert flat, which ranges between 4000 and 5000 feet in altitude, while *fuscus fisheri* was not taken below 7000 feet.

The present records extend the known geographic range of the species considerably to the northward. The type locality is Austin, Lander County, Nevada, which lies a hundred miles south and east of Winnemucca. Quinn River Crossing is about sixty miles north and west of the same place. Further work will undoubtedly show *nevadensis* to be generally distributed in suitable situations on the flat of the northern part, at least, of the Great Basin Plateau.

Habits.—Allen (1895b, p. 207) and Grinnell (1908, p. 151) record the preponderance of females in series of gophers from particular localities. The results of our trapping show a similar discrepancy in relative numbers of the sexes. Only five specimens of the seventeen secured are males.

Apparently there is a fairly definite mating period. The first juvenal was taken on May 29, and thereafter young specimens were secured almost every day. All adults showed by the condition of the reproductive organs that sexual activity was at its height. Evidently our work was carried on during the suckling period. None of the females secured contained embryos. No. 7869, a male juvenal, was caught June 13, and possesses skull characters that would be expected in a specimen two weeks older than the first ones caught the last of May.

Very large mounds of earth are thrown up by this species. One mound seen at Big Creek Ranch was three feet long and two feet wide, and contained a freshly dug out stone three inches long and two inches in diameter. Wherever workings were

observed they testified to the great relative size of the gophers. Holes which were probably used as vents for getting rid of superfluous earth were found leading into many of the main burrows.

Our trapping of this species was carried on exclusively in the alfalfa and wild-hay fields about the Quinn River and Big Creek ranches. Since the pouch of one specimen contained wild-hay stalks, and since closely trimmed alfalfa and wild-hay plants were seen about some of the burrows, it may be concluded that these plants form a large part of the animal's food.

As would be expected, workings were most frequently found in loose earth. We were most successful in securing specimens in decidedly damp soil near an irrigating ditch on the Quinn River Ranch.

Perodipus microps levipes C. H. Merriam.

Panamint Kangaroo Rat.

Status.—The kangaroo rats of the genus *Perodipus* have proven more difficult to identify satisfactorily than any other mammals taken by the Nevada Expedition.

There are at hand three near topotypes of *Perodipus columbianus* C. H. Merriam the data of which are as follows (all are from the Biological Survey Collection):

$\frac{24182}{31595}$ ♂ Umatilla, Oregon, Oct. 17, 1890; C. P. Streator.

$\frac{23752}{31147}$ ♀ Touchet, Washington, Sept. 13, 1890; C. P. Streator.

$\frac{23744}{31139}$ ♀ Touchet, Washington, Sept. 11, 1890; C. P. Streator.

The type locality of *columbianus* is Umatilla, Oregon. Touchet, Washington, is in Walla Walla County, a little north and west of Umatilla.

Two topotypes of *Perodipus microps levipes* C. H. Merriam are also available (both from the Biological Survey Collection).

$\frac{28537}{40641}$ ♀ Grapevine Mountains, Nevada, June 7, 1891; E. W. Nelson.

$\frac{29273}{41340}$ ♂ Panamint Mountains, California, May 24, 1891; E. W. Nelson.

Perognathus Flat, Panamint Mountains, is the type locality of *P. m. levipes*. Access to these specimens is through the kind offices of Dr. C. Hart Merriam.

Cranial Measurements of Topotypes or Typical Specimens of *Perodipus columbianus* and *Perodipus microps levipes*.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

	Museum No.	Sex	Locality	Greatest length	Greatest width*	Width at anterior root of maxillary arches	Nasals	Width of nasals posteriorly†	Width of nasals anteriorly‡	Greatest median length of cranium§	Height of cranium at bullae
P. columbianus	31595	♂	Umatilla, Ore.	35.4	22.2	19.1	12.8	3.1	2.9	33.6	12.0
	31147	♀	Touchet, Wash.	36.5	23.2	19.6	12.9	3.1	3.6	35.1	12.5
	31139	♀	Touchet, Wash.	35.7	22.1	18.5	12.8	3.0	3.1	34.2	12.1
			Average of typical *columbianus*	35.86	22.50	19.06	12.83	3.06	3.20	34.30	12.20
P. m. levipes	40641	♀	Grapevine Mts., Cal.	34.6	21.7	18.0	11.7	2.2	2.8	33.1	12.0
	41340	♂	Panamint Mts., Cal.	39.0	23.5	19.9	13.7	2.7	3.3	36.9	12.7
			Average of typical *levipes*	36.80	22.60	18.95	12.70	2.45	3.05	35.00	12.35

* Measured just anterior of external auditory meatus.

† Measured at bulge just anterior of posterior end of the bones.

‡ Measured just anterior of point where premaxillaries bend downward.

§ Measured along median line from most posterior point on supraoccipital to anterior ends of nasals.

Coloration seems to be unreliable as a diagnostic character. If the near topotypes of these two species were to be mixed with our series it would be impossible to pick them out except by make-up of skins. Size should serve at once to distinguish *columbianus* from *levipes*, for the former has total length, 244.5 mm., tail vertebrae, 140.5, and hind foot, 39; while the latter has 289.5, 164, and 42.4, respectively. Adults of our series present the following average measurements: 271.4, 161.2, and 42, respectively. Thus in dimensions the animals from Quinn River Crossing are intermediate between *columbianus* and *levipes*, though nearer the latter.

External Measurements of *Perodipus microps levipes* From Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot
7875	♂	265	167	42
7879	♀	277	167	42
7876	♀	267	156	41
7872	♀	273	152	41
7873	♂	275	164	44
Average of all the adults		271.4	161.2	42

External Measurements of Three Young Adults of *Perodipus microps levipes.*

Museum No.	Sex	Total length	Tail vertebrae	Hind foot
7878	♀	239	138	40
7877	♂	258	147	40
8313	♂	.....	.....	42
Average of the three young adults		248.5	142.5	40.6

One adult specimen of our series (no. 7874) was not included in the above averages, having been referred to *columbianus*. It has its total length 244 mm., and its tail vertebrae 136, as might be expected in that form. Its hind foot is 41, a little long for *columbianus*. However, in coloration it coincides remarkably with the topotypes of this species at hand, and was unquestionably referred to it until the cranial characters were taken into consideration. These lead to the conclusion that it is identical with the rest of our series, which, while impossible to be referred clearly to either species, has been tentatively identified as *levipes*. There are a number of differences observable between our series and either *columbianus* or *levipes*, but they are inconstant, and there is nearly as much difference between individuals of the same species, as represented by the topotypes, as there is between our animals and either species.

The specimens (except no. 7874) are a shade darker than *columbianus* as exemplified by the typical specimens. This may be due to wear and a consequent greater exposure of the plumbeous bases of the hairs; for evidently the Nevada animals have not molted, while at least two of the topotypes (nos. 24182 and

23752) have the new pelage, and the other one (no. 23744) is still in the process of molt. The new pelage, as shown by this specimen, is brighter buffy.

Three of the Nevada animals (nos. 7878, 8313, and 7877) are young adults, as is shown by the degree of development of their skulls, their bluer coloration, the character of their pelage, and by their smaller measurements (see table).

The frontal and parietal regions of the skull are much less inflated in the Nevada specimens than in *columbianus*, and the incisors average slightly broader. The only comparable skull of *levipes* is no. 41340, for no. 40641 is evidently a young animal, and its size is not typical. The animals from Quinn River resemble no. 41340, although they are somewhat smaller. The

Cranial Measurements* of *Perodipus microps levipes* From Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Greatest length	Greatest width	Width of anterior root of maxillary arches	Nasals	Width nasals posteriorly	Width nasals anteriorly	Greatest median length of cranium	Height of cranium at bullae
7875	♂	36.0	22.7	18.2	12.5	2.6	3.2	34.1	12.3
7873	♂	37.4	23.4	20.0	12.5	2.6	3.8	36.0	13.1
7876	♀	36.8	24.4	19.2	12.5	2.7	3.5	35.1	12.7
7872	♀	36.9	24.1	20.0	.....	2.7	3.4	34.7	12.9
7879	♀	36.4	23.2	19.2	12.7	2.6	3.6	34.7	12.7
Average of all the adults		36.7	23.5	19.3	12.5	2.6	3.5	34.9	12.7

Cranial Measurements of Young Adults of *Perodipus microps levipes*.

Museum No.	Sex	Greatest length	Greatest width	Width at anterior root of maxillary arches	Nasals	Width nasals posteriorly	Width nasals anteriorly	Greatest length of skull, median line	Height of cranium at bullae
7877	♂	36.9	23.5	19.1	12.3	2.6	2.9	34.9	12.8
8313	♂	35.8	22.6	.....	12.1	2.5	3.2	34.0	12.4
7878	♀	.....	22.1	.....	.....	2.0	.....	.....	12.2
Average of the young adults		36.3	22.7	19.1	12.2	2.5	3.0	34.4	12.4

* For special methods of taking measurements see the table on page 268.

postero-external angle of the maxillary arch in the Nevada specimens is not nearly so pronounced, or produced so much backward, as in *columbianus*, being nearer *levipes* in this respect. A tendency seems to exist in the Nevada animals to have the nasals more spread anteriorly than in either species.

The angle of the mandible varies greatly in all the specimens. Our series seem to have sharper angles than either of the others. One example of *levipes* (no. 40641) has the angle sharp, as in the Nevada series; the other (no. 41340) has it much more blunt. There is in this respect also more difference between these two specimens than between the Quinn River series and the average of either *levipes* or *columbianus*.

Not one of the skulls resembles those of topotypes of *columbianus*. While not typical of the form, they are certainly nearer *levipes*. However, the lot is nearly as well marked off from *levipes* as is *columbianus;* this is not nearly as startling a statement as it might seem, for a consideration of available topotypes of the two shows them to be closely related. The Quinn River animals are certainly a fairly well-marked local race.

Distribution.—Ten specimens of *Perodipus microps levipes* were definitely recorded: from Quinn River Crossing (4100 feet), 8; from Big Creek Ranch (4350 feet), 1; from Virgin Valley (5000 feet), 1. These records serve to extend the known range of *levipes* with its variants to the northern part of the Great Basin. Bailey (1908, p. 22) mentions this as one of the species found in the Carson Sink and some of the neighboring valleys. Zonally its distribution is purely Upper Sonoran.

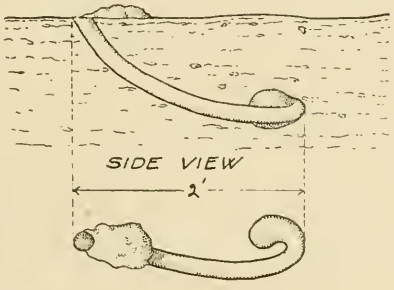


Fig. 2. Side and top views (diagrammatic) of burrow of kangaroo rat.

Habits.—The first evidence we had of the presence of *Perodipus* was a tail and the hind foot which had been left on the desert by some predaceous animal. At Amos we dug out a kangaroo rat's nest. Whether it was that of a *Dipodomys* or *Perodipus* was not determined; but in all probability the two are quite similar in burrowing habits. Since *Perodipus* was the common genus, however, the chances favor its belonging to *P. m. levipes.* The rat was frightened from the burrow by our digging. The hole was in soft soil, the nest itself being located about a foot in depth and two feet from the entrance in an enlarged chamber (see figure 2). It was built of green and dry grass and contained a quantity of green plant seed. The green grass and the seeds were probably stored for food. A *Perodipus* caught June 5 had several pieces of mouse-excrement in its cheek pouches. Kangaroo rats were caught on the open desert, several of them in front of burrows, presumably their own. They were evidently not common anywhere, though more numerous on the plains than along the foothills of the Pine Forest Mountains.

Dipodomys merriami nevadensis C. H. Merriam.

Nevada Kangaroo Rat.

Status.—Dr. C. Hart Merriam has kindly examined our single specimen of *Dipodomys* (an adult female, no. 7880, taken at Quinn River Crossing on May 30, 1909), and identifies it as belonging to this species.

There are however some discrepancies apparent when this specimen is compared with the original description of *nevadensis* (C. H. Merriam, 1894b, p.111). These differences might show our specimen to be the extreme of a hypothetical series of *nevadensis,* incidentally approaching *Dipodomys m. simiolus.* This seems more probable than that the differences represent an innate departure from the mean of *nevadensis.* The specimen is a female, while probably some of the specimens, at least, upon which Dr. Merriam based his description, are males. It measures: total length, 215; tail vertebrae, 127; and hind foot, 35. The measurements of the type specimen of *nevadensis* are: total length, 240; tail vertebrae, 140; and hind foot, 39. Five adults

from the type locality are said to measure as follows: total length, 243; tail vertebrae, 143.5; and hind foot, 39.9.

The coloration of *nevadensis* is described (Merriam, 1894b, p. 111) as follows: "Upper parts pinkish buff, darkened on head and back by intermixture of dark-tipped hairs; facial crescents distinct but hardly meeting across nose, though bridge of nose is somewhat darkened; face in front of eyes pure white except where interrupted at base of whiskers by facial crescents; underparts and thigh stripes pure white; dorsal and ventral tail stripes dusky, meeting at end of tail; inner side of legs to heel dusky."

Although our specimen has the upper parts pinkish buff, it has no dark-tipped hairs on the head and back, its facial crescents are obsolete, and the bridge of the nose is not appreciably darkened. The face in front of the eyes is white, with the exception of a very faint suggestion of buffy on the sides of the nose. The underparts and thigh stripes are pure white. The dorsal and ventral tail stripes are very light clay color, meeting at the end of the tail. The inner side of hind leg to heel is clothed with plumbeous hairs tipped with buffy. There is, moreover, a distinct spot of white above the eyes, and the area just behind the ears is white.

The specimen presents some resemblance to *Dipodomys merriami simiolus*.

Measurements of a Series of Topotypes of *D. m. simiolus* from Palm Springs, California.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot
5358	♀	227	140	36
6928	♀	256	157	39
5355	♀	238	143	37
5357	♂	235	136	36
5348	♂	235	135	37
5359	♂	245	150	37
5356	♂	238	141	37
Average, females		240.3	146.6	37.3
Average, males		238.2	140.5	36.7
Average, adults		239.1	143.1	37.0

Measurements of the Specimen of *D. m. nevadensis* From Quinn River Crossing, Humboldt County, Nevada.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot
7880	♀	215	127	35

The table shows that there is difference in size between our specimen and *simiolus*. The dorsal and ventral tail stripes of the Nevada specimen are very much lighter than the corresponding ones of the topotype series of *simiolus*, which present a dusky coloration.

Although the skull of the Nevada *Dipodomys* resembles that of *simiolus* in a general way, it is smaller, has a slightly different shape, and presents several lesser differences. The articular process of the mandible is, for example, much narrower.

The species must be rather rare in the region explored, as we carried on systematic trapping in localities apparently in every way favorable for its habitation. The specimen secured was caught in a trap set near a small bush on the open desert.

Perognathus parvus olivaceus C. H. Merriam.

Great Basin Pocket Mouse.

Status.—As might be anticipated from geographical considerations our series proves to be referable to this species. Compared with Osgood's description of *olivaceus* (1900, p. 37) our specimens have the lateral line varying in shade, but more pinkish buff than cinnamon buff. The coloration dorsally is variable, most of the series being buffy, but some presenting a dark grayish tone. The difference between the two types of coloration is not great enough to justify the statement that there are two color phases, and apparently is due merely to individual variation, as it is impossible to correlate the types of coloration with age, sex, or locality. Specimens intermediate between the two extremes are present. The subauricular spot is conspicuous in only about twenty-five per cent. of the series. Of thirty-two specimens, only two (nos. 8125, 8131), have buffy-tipped belly hairs with plumbeous bases. One juvenal (no. 8144) has buffy-tipped hairs ventrally, but their bases are not plumbeous. The inner side of fore leg is white except in four specimens (nos. 8125, 8137, 8134, 8122).

As regards size, the Humboldt County animals average smaller than the type specimen of *olivaceus*, but accord fairly well with the averages as given by Osgood.

Cranial characters of the series are those of *olivaceus*, although in none of the skulls do the auditory bullae meet anteriorly, even in a weak symphysis.

A small series of *Perognathus p. mollipilosus* Coues (type locality Fort Crook, Shasta County, California), from Mount Shasta, is contained in the Museum collection. That this form does evince a tendency to approach *olivaceus*, as remarked by Osgood (1900, p. 37), is evidenced by the fact that were the specimens of *mollipilosus* to be mixed with the series from Nevada it would be impossible to segregate the animals by their *coloration*. The most practical differential character appears to be size, *olivaceus* being larger.

As exemplified by our series, *Perognathus p. olivaceus* differs from *P. p. parvus* (Peale), type locality, The Dalles (?), Oregon, in having the ventral hairs normally white instead of buffy. In size *olivaceus* is slightly greater. The species approaches *parvus* in a tendency to have the proximal fourth of the sole of the hind foot haired. Tail, ears and subaurical spot as in *parvus*. The two subspecies are evidently closely allied.

P. p. olivaceus is immediately distinguished from *P. p. magruderensis* Osgood, type locality, 8000 feet altitude, Mount Magruder, Nevada, at least as far as our specimens are concerned, by its much smaller size.

Certain individual peculiarities of pelage deserve mention. No. 8125, an adult male, trapped June 2, at Quinn River Crossing, is molting into the post-breeding pelage. The line separating the new hair from the old is distinct at about two-thirds of the distance from head to tail. The new pelage does not differ appreciably in color from the breeding coat. The molt appears to have proceeded uniformly from before backward. In no. 8121, breeding female, taken May 18, at the same locality, the new pelage is darker and less buffy than the old. No. 8150, adult female, secured August 8, on Leonard Creek, has the molt uneven, and the pelage patchy. In no. 8135, adult male, taken on June 13 at Big Creek Ranch, the molt has progressed most rapidly dorsally, and has reached the tail medially, but not on the sides. No. 8124, breeding female, Quinn River Crossing, May 26, also shows a distinct molt-line. In the others (with the exception of

External and Cranial Measurements of *Perognathus parvus olivaceus*, All From Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Adults from Altitudes ranging from 4100 to 4400 feet.

Museum No.	Sex	Exact locality	External			Cranial						
			Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Length* of skull	Mastoid width	Interparietal	Interorbital constriction	Nasals	Ratio, interparietal width to basilar length
8125	♂	Quinn River Crossing	192	103	24	19.2	27.0	13.4	3.5 × 6.3	6.0	11.0	32.8
8126	♂	Quinn River Crossing	.....	.....	22	.....	.....	.....	....	.....	.....	.....
8122	♂	Quinn River Crossing	177	93	23	18.4	25.9	13.0	3.7 × 5.5	5.9	10.7	29.9
8135	♂	Big Creek Ranch, Pine Forest Mts.	163	91	21	.....	.....	.....	....	.....	.....	.....
8137	♂	Big Creek Ranch, Pine Forest Mts.	185	101	24	.....	.....	.....	....	.....	.....	.....
8134	♂	Big Creek Ranch, Pine Forest Mts.	166	86	23	.....	.....	.....	....	.....	.....	.....
8133	♂	Big Creek Ranch, Pine Forest Mts.	180	95	24	18.6	26.3	13.5	3.9 × 5.9	6.0	10.3	31.7
8121	♀	Quinn River Crossing	176	93	24	.....	.....	.....	....	.....	.....	.....
8123	♀	Quinn River Crossing	188	101	26	.....	.....	.....	....	.....	.....	.....
8124	♀	Quinn River Crossing	191	96	23	18.5	26.6	12.7	3.3 × 5.4	5.9	10.7	29.2
8128	♀	Quinn River Crossing	.....	.....	23	.....	.....	.....	....	.....	.....	.....
8130	♀	Quinn River Crossing	167	86	19	.....	25.3	13.0	3.2 × 5.0	5.8	9.8	.....
8131	♀	Big Creek Ranch, Pine Forest Mts.	165	89	21	17.6	24.9	12.5	3.2 × 5.0	5.5	9.9	28.4
		Average of the males	177.1	94.8	23.0	18.7	26.4	13.3	3.7 × 5.9	5.9	10.6	31.46
		Average of the females	177.4	93.0	22.6	18.0	25.6	12.7	3.2 × 5.1	5.7	10.1	28.80
		Average of all the adults	177.2	94.0	22.8	18.4	26.0	13.0	3.4 × 5.5	5.8	10.4	30.40

* Along medial line from most posterior point occipital to end of nasals.

EXTERNAL AND CRANIAL MEASUREMENTS OF *Perognathus parvus olivaceus*, ALL FROM HUMBOLDT COUNTY, NEVADA.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Adults from Altitudes above 6000 feet.

Museum No.	Sex	Exact locality	External			Cranial						
			Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Length* of skull	Mastoid width	Interparietal	Interorbital constriction	Nasals	Ratio, interparietal width to basilar length
8152	♂	Leonard Creek, Pine Forest Mts.	174	94	24	17.6	25.3	13.0	3.3 × 4.9	5.6	9.6	27.6
8147	♂	Leonard Creek, Pine Forest Mts.	180	99	24	.....	.....	.....	....	.....	.....	.....
8140	♂	Big Creek, Pine Forest Mts.	195	103	26	19.8	27.2	13.3	3.3 × 5.3	6.0	11.0	26.8
8149	♀	Leonard Creek, Pine Forest Mts.	169	91	23	.....	.....	.....	....	.....	.....	.....
8148	♀	Leonard Creek, Pine Forest Mts.	173	90	23	18.2	26.0	12.8	....	5.6	9.9	.....
8150	♀	Leonard Creek, Pine Forest Mts.	176	98	23	.....	.....	.....	....	.....	.....	.....
8142	♀	Big Creek, Pine Forest Mts.	175	92	24	.....	.....	.....	....	.....	.....	.....
8141	♀	Big Creek, Pine Forest Mts.	175	90	23	.....	.....	.....	....	.....	.....	.....
		Average of the males	183.0	98.6	24.6	18.7	26.2	13.1	3.3 × 5.1	5.8	10.3	27.2
		Average of the females	173.6	92.2	23.2	18.2	26.0	12.8	....	5.6	9.9	.....
		Average of all the adults	177.1	94.6	23.7	18.5	26.1	13.0	3.3 × 5.1	5.7	10.1	27.2

* Along medial line from most posterior point occipital to end of nasals.

no. 8147) this is not discernible. Four specimens have one or more small spots of white dorsally (nos. 8121-8124). No. 8147, though seeming to have assumed the new pelage dorsally for the most part, has the pelage ventrally in an abnormally worn condition.

Juvenals of *olivaceus*, as shown by nine examples, differ from the adults chiefly in their mouse-gray coloration dorsally.

Distribution.—Specimens were secured as follows: Quinn River Crossing (altitude 4100 feet), 10; Big Creek Ranch (4350 feet), 9; Big Creek (7000 feet), 5; head of Big Creek (8000 feet), 1; Duffer Peak (8400 feet), 1; Leonard Creek (6500 feet), 7. All of these localities, except Quinn River Crossing, are in the Pine Forest Mountains.

The present records, while not extending the known range of the species geographically, probably do have this effect zonally. Osgood refers *olivaceus* to the Upper Sonoran. We found the species extending in small numbers into very high Upper Sonoran and following sage slopes into Lower Transition.

In order to ascertain whether there was any tendency to local variation at altitudes above those of the Great Basin plateau at large, I segregated all the specimens from the higher parts of the mountains from those of the desert flat, and tabulated their measurements (see table of external and cranial measurements). I was thus enabled to prove definitely that, at least so far as our material goes, there is practically no variation in size (and there is none in coloration) with altitude.

It is extremely probable that *Perognathus parvus olivaceus* intergrades with *P. p. parvus* to the north (Osgood records specimens of *parvus* from Tumtum Lake, Harney County, Oregon, which is not far north of Quinn River Crossing, and in the same general faunal area), with *P. p. mollipilosus* to the west, and possibly with *P. p. magruderensis* to the south.

Habits.—The cheek-pouches of a pocket mouse taken on May 19 at Quinn River Crossing were filled with green seeds.

The animals live in shallow burrows. In several instances specimens were caught at the mouths of small holes.

While *Perognathus p. olivaceus* is not limited in its distribution to the neighborhood of streams, we were more successful

when we trapped in the vicinity of some water-course. Several individuals were caught on the open desert far from water. A couple of juvenals, and these happen to be the specimens taken at the greatest altitude, were secured on exposed rocky ridges. Two were caught near a ditch in an alfalfa field at Big Creek Ranch. So the species may be said to be quite generally distributed in different types of habitat.

A *Perognathus* was seen at dusk hopping rapidly along through the brush, apparently covering twelve or fourteen inches at each jump.

As regards breeding habits, I have already mentioned the taking of a series of nine young animals. The first is dated June 14, and was taken at Big Creek Ranch. The last was secured on Leonard Creek August 8. None of these are in the very young stage, but might be more properly termed "adolescent." A female taken at Quinn River Crossing on May 18 contained six embryos, and another secured June 10 at Big Creek Ranch contained eight. A female taken May 26, and two secured July 7, at Quinn River Crossing (4100 feet), and Big Creek (6000 feet), respectively, were suckling young. Two females caught May 26 and June 10, respectively, possessed three pairs of mammae, of which two were abdominal and one pectoral. Numbers of the sexes in our material are nearly evenly divided, fourteen of the series being females and eighteen males.

Perognathus nevadensis C. H. Merriam.

Nevada Pocket Mouse.

Status.—The size of the specimens collected at Quinn River Crossing and Big Creek Ranch averages slightly greater than that of the type of *nevadensis* C. H. Merriam (1894a, p. 264), but smaller than average measurements of twenty-four topotypes.

All our series have a very definite buffy tinge dorsally. No. 8113 is much paler buffy than the others. Every specimen except one (no. 8120) is in process of assuming the post-breeding pelage. The molt appears to start at the nose and proceed posteriorly in an irregular fashion. The post-breeding pelage is evidently appreciably darker than the breeding coat. The type of *nevadensis*

External Measurements of *Perognathus nevadensis* From Quinn River Crossing, Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot
8113	♂	110	54	18
8118	♂	131	74	19
8115	♂	143	81	18
8116	♀	130	69	18
8119	♀	.....	....	19
8117	♀	122	68	18
8114	♀	129	71	19
Average of the males		128.0	69.6	18.3
Average of the females		127.0	69.3	18.5
Average of all the adults		127.5	69.5	18.4

was evidently an animal in the post-breeding pelage, as it was taken on July 4, and the description seems to accord with the darker coat. Our series was taken May 24 to June 10, and is molting rapidly. Thus for accurate characterization it is necessary to distinguish between the two pelages.

In the original description the dull buffy ochraceous lateral stripe is said to spread out over the belly, leaving only the throat and pectoral region white. The buffy ochraceous in *nevadensis* from Humboldt County is only a very light wash, so that the general impression one gets from the underparts is white rather than buffy. In two specimens (nos. 8120, 8117) the underparts are pure white, except in the anal region in the case of the latter, which is buffy. Number 8120 is an adolescent. Its general coloration is a slaty gray, and it has the tail very thinly haired. The buffy lateral line, besides, is much paler than in other specimens.

Distribution and Habits.—*Perognathus nevadensis* was taken at two localities only, namely Quinn River Crossing and Big Creek Ranch. The animals did not seem to evince any preference for the vicinity of streams, but were caught at a quarter to a half mile from water under the low desert brush plants. They lived in very small burrows which were always placed in the neighborhood of the sagebrush (*Artemisia tridentata*) or other plant of the open desert association. The animals were evidently not common, as but eight specimens, five females and three males, were caught. One of the latter (no. 8113) had the testes much

enlarged, signifying sexual activity. A female (no. 8116) contained three embryos. One specimen (no. 8120) was evidently born this year. It was caught at Big Creek Ranch (altitude 4350 feet), June 10, 1909.

Osgood (1900, p. 31) gives the distribution of *nevadensis* as Upper Sonoran zone of central Nevada; northward to southern Oregon and northern Utah. Our collections add to the number of record stations, the nearest of those listed by Osgood being Tumtum Lake in Harney County, Oregon, and Golconda, east of Winnemucca, Nevada. Quinn River Crossing is about midway between these two localities.

Zapus princeps oregonus Preble.

Blue Mountains Jumping Mouse.

Status.—Our specimens of *Zapus* are referred to this form by Dr. C. Hart Merriam and Mr. E. A. Preble. As nearly as can be ascertained (largely from a study of the original description, Preble, 1899, p. 24) without comparable specimens of *oregonus* from the type locality, the Nevada animals are, however not entirely typical of that form, being smaller than published measurements, and having nearly obsolete the narrower lateral stripe separating the color dorsally from the pure white underparts.

There is at hand a series of *Zapus* from the Warner Mountains, California, just south of the Oregon line, and presumably not far from the type locality of *Zapus major* Preble. The Warner Mountains of California are directly west of and visible from the Pine Forest Mountains of Nevada, the two ranges being eighty to ninety miles apart. These specimens of *major*, while not strikingly different from our Nevada *Zapus*, nevertheless do show differentiating characters. For example, the Warner Mountain animals are darker dorsally, the effect being due to an admixture of more black hairs. The sides are near an ochraceous-buff, as against the buffy of the series of *oregonus*. The dorsal darkening of *major* extends anteriorly onto the face, which averages definitely darker than in the Nevada animals. The narrow lateral stripe separating the dorsal coloration area from the pure white

underparts is less prominent in the Warner Mountain series than even in *oregonus* from Nevada.

The dimensions of the latter average less than those of the former (see table of measurements). The ratios of tail vertebrae and hind foot to total length vary somewhat between the two, also. For example, the ratio of tail vertebrae to total length in *major* is slightly less than in *oregonus*, while the ratio of hind foot to total length is slightly greater.

External Measurements of *Zapus princeps oregonus* From the Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.
All dimensions are in millimeters.

Museum No.	Sex	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
7994	♂	234	145	32	62.0	13.7
7992	♂	222	127	31	57.2	14.0
7989	♂	213	130	30	61.0	14.1
7985	♂	230	136	33	59.2	14.3
7987	♂	230	136	31	59.2	13.5
7988	♀	223	136	31	60.9	13.9
7986	♀	.....	.....	34	.....	.....
7984	♀	.....	.....	31	.....	.....
7991	♀	235	141	33	60.0	14.0
7993	♀	220	125	32	56.8	14.5
Average of the males		225.8	134.8	31.4	59.7	13.9
Average of the females		226.0	134.0	32.2	59.2	14.1
Average of all the adults		225.8	134.0	31.8	59.5	14.0

External Measurements of *Zapus major* From the Warner Mountains, Modoc County, California.

Museum No.	Sex	Locality	Total length	Tail vertebrae	Hind foot	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
11273	♂	Parker Creek, 5500 ft.	226	137	31	60.6	13.7
11287	♂	Parker Creek, 5500 ft.	224	132	30	58.9	13.4
11274	♂	Parker Creek, 5500 ft.	226	134	30	59.3	13.3
11282	♂	Parker Creek, 5500 ft.	227	138	30	60.8	13.2
11289	♀	Parker Creek, 5500 ft.	231	140	32	60.6	13.9
11288	♀	Warren Peak, 8700 ft.	250	150	32	60.0	12.8
11286	♀	Parker Creek, 7300 ft.	238	141	30	59.2	12.6
11272	♀	Parker Creek, 5500 ft.	240	144	30	60.0	12.5
Average of the males			225.7	135.2	30.2	59.9	13.4
Average of the females			239.7	143.7	31.0	59.9	12.9
Average of all the adults			232.7	139.5	30.6	59.9	13.1

Cranial measurements show somewhat similar differences. The series from Nevada is smaller in all respects (see table of measurements) except the interorbital constriction and width of rostrum posteriorly. An examination of the skulls shows that the rostrum in *oregonus* is shorter and broader than in *major*, the skulls are smaller, the zygomatic arches are not so wide-spreading, and the interorbital constriction appears broader. The last-mentioned point shows up remarkably in the smaller skulls. The interpterygoid fossa is narrower and more rounded anteriorly in *oregonus*. The thin arm of the malar is stronger in *oregonus* than in *major*. There is a slightly greater inflation of the parietal and temporal regions in the skulls of *major*.

The young of *oregonus* are very similar to the adults, though

Cranial Measurements of *Zapus princeps oregonus*, From Pine Forest Mountains, Humboldt County, Nevada.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Basilar length of Hensel	Zygomatic width	Mastoid width	Interorbital constriction	Incisor to post-palatal notch*	Post-palatal length†	Fronto-palatal depth at middle of molar series‡	Width of rostrum posteriorly§	Width of rostrum anteriorly§§
7994	♂	18.1	12.6	10.9	4.6	9.7	8.2	6.6	3.9	2.8
7992	♂	18.1	12.5	.....	4.4	9.2	8.8	6.5	3.9	2.7
7989	♂	17.9	11.7	10.9	4.9	9.3	8.5	6.6	4.1	2.8
7984	♀	18.0	12.3	.....	4.4	9.3	8.4	6.2	3.9	2.8
7986	♀	18.3	12.7	11.2	4.8	9.7	8.8	6.6	4.1	2.9
7991	♀	18.3	12.6	11.0	4.6	9.4	8.8	6.5	4.0	2.8
7993	♀	17.9	12.2	10.8	4.8	9.1	8.5	6.4	3.8	2.6
Average of the males		18.03	12.26	10.90	4.63	9.40	8.50	6.56	3.96	2.76
Average of the females		18.12	12.45	11.00	4.65	9.37	8.62	6.42	3.95	2.77
Average of all the adults		18.08	12.37	10.96	4.64	9.38	8.57	6.48	3.95	2.77

* Measured from posterior margin alveolus of incisor to most anterior point post-palatal notch.

† Measured from inferior lip foramen magnum to most anterior point post-palatal notch.

‡ Measured perpendicularly.

§ Measured just anterior of point of junction of zygomatic arches with the skull.

§§ Measured at anterior end.

Cranial Measurements* of *Zapus major* From the Warner Mountains, Modoc County, California.

For method of taking measurements, see Introduction.

All dimensions are in millimeters.

Museum No.	Sex	Locality	Basilar length of Hensel	Zygomatic width	Mastoid width	Interorbital constriction	Incisor to post-palatal notch	Post-palatal length	Fronto-palatal depth at middle of molar series	Width of rostrum posteriorly	Width of rostrum anteriorly
11273	♂	Parker Creek, 5500 ft.	17.9	12.8	11.0	4.5	9.7	8.4	6.2	4.0	3.1
11287	♂	Parker Creek, 5500 ft.	18.0	13.2	11.2	4.8	9.9	8.6	6.6	3.9	2.8
11274	♂	Parker Creek, 5500 ft.	18.2	12.6	11.3	4.6	9.8	8.5	6.7	3.7	3.0
11282	♂	Parker Creek, 5500 ft.	18.4	12.9	11.2	4.6	10.2	8.4	6.8	3.6	2.8
11289	♀	Parker Creek, 5500 ft.	18.0	12.6	11.1	4.6	9.7	8.6	6.7	4.0	2.9
11288	♀	Warren Peak, 8700 ft.	18.5	12.9	11.5	4.7	10.5	8.5	6 9	4.1	2.8
11286	♀	Parker Creek, 7300 ft.	18.7	13.2	11.6	4.5	10.0	9.1	7.1	3.8	3.1
11272	♀	Parker Creek, 5500 ft.	18.3	12.8	11.3	4.5	10.0	8.7	6.6	4.0	2.9
		Average of the males	18.12	12.87	11.17	4.62	9.90	8.47	6.57	3.80	2.92
		Average of the females	18.37	12.87	11.37	4.57	10.05	8.72	6.82	3.97	2.92
		Average of all the adults	18.25	12.87	11.27	4.60	9.97	8.60	6.70	3.88	2.92

* For special modes of taking measurements see table immediately preceding.

they present softer fur and a relatively greater number of black hairs on the sides. It is very difficult to formulate differences between adults and young from a study of skins. It is necessary in every doubtful case to examine the teeth and skull to determine age. In young adults or in juvenals it is impossible to draw a line definitely separating the color of the back from that of the sides, but this is not a character of youth exclusively, some of the unquestioned adults of our series displaying it. One young female (no. 7998) is slightly grayer than the adults.

A glance at the table of external measurements shows the dimensions of males and females to be nearly the same. The list of ratios draws attention to the fact that the various western species of *Zapus* are very similar in respect to proportionate external measurements, *i.e.*, ratios of length of tail vertebrae and hind foot to total length. *Oregonus* from Nevada differs almost as much in this respect from any other species in the group as these species differ from each other, being apparently nearest *montanus*. In fact, our specimens of *oregonus* from

Nevada differ to a comparable degree even from specimens of the same species from the Blue Mountains of Oregon. These facts tend to show that these ratios are of no great significance in the diagnosis of species of *Zapus*.

Ratios of Tail Vertebrae and Hind Foot to Total Length in Various Western Species of *Zapus*.*

	Ratio, tail vertebrae to total length	Ratio, hind foot to total length
Zapus princeps oregonus (typical)	60.1	13.2
Zapus princeps oregonus from Pine Forest Mts.	59.5	14.0
Zapus major	60.8	13.7
Zapus nevadensis	62.0	13.6
Zapus trinotatus alleni	61.2	13.8
Zapus montanus	59.2	13.6
Zapus pacificus	62.7	13.7
Zapus orarius	57.7	13.6

* Based on measurements given in Preble's (1899) revision of the group.

I have accepted C. H. Merriam's and Preble's identification in view of the material at their disposal. From a study of the characters of the Pine Forest Mountain animal and a careful checking up of the descriptions of other species, I have, however, reached the conclusion that while perhaps referable to *oregonus*, it is nevertheless not typical of that form, at least as characterized in the original description (Preble, 1899, p. 24), but represents an incipient species, not sufficiently differentiated to warrant designation by name. The following species of *Zapus* are among those described from western North America: (1) *Zapus princeps oregonus* Preble, type locality Elgin, Blue Mountains, Union County, Oregon; (2) *Zapus major* Preble, Warner Mountains, Lake County, Oregon; (3) *Zapus nevadensis* Preble, Ruby Mountains, Elko County, Nevada; (4) *Zapus montanus* C. H. Merriam, Crater Lake, Mount Mazama, Klamath County, Oregon; (5) *Zapus pacificus* C. H. Merriam, Prospect, Rogue River Valley, Jackson County, Oregon; (6) *Zapus orarius* Preble, Point Reyes, Marin County, California; (7) *Zapus trinotatus* Rhoads, Lulu Island, mouth of Fraser River, British Columbia; and (8) *Zapus trinotatus alleni* Elliot, Pyramid Peak, Lake Tahoe, Cali-

fornia. The occurrence of such a large number of species in an area comparatively small leads to the conclusion that the jumping mice are a plastic group of mammals. The Pine Forest Mountain animal is at present limited so far as known to one range of desert mountains. Its evident variation from typical *oregonus*, coupled with its geographic and topographic situation, proclaim it at least a well-marked local race of that form.

Distribution.—Jumping mice were taken along streams from 6000 to 8400 feet altitude in the Pine Forest Mountains. By localities they were recorded as follows: head of Big Creek (8000 feet), 13; Alder Creek (6000 feet), 2; meadow near Duffer Peak (8400 feet), 1; and Leonard Creek (6500 feet), 2. These points of capture lie in Transition and Canadian(?) life-zones.

The present records extend the range of *Zapus p. oregonus* very materially. Preble in his list of material examined (1899, p. 24) mentions the following localities: Blue Mountains of Oregon (Harney, Elgin, Strawberry Butte), and Mountain City, northern Elko County, Nevada. He remarks that the single specimen from the latter point is not typical. The geographic distribution of the subspecies is given as the "Blue Mountains of Oregon."

Habits.—As will have been observed, most of our jumping mice were captured at the head of Big Creek. Most of these were taken very near the stream. One was caught in a comparatively dry place under a sagebush twenty feet from the creek. The jumping mice and the cantankerous meadow mice were for the most part caught in similar situations.

We were very much surprised to find *Zapus* on Alder Creek at as low an altitude as 6000 feet. One trapped at this locality was taken under a sagebush thirty feet from the water, the other under a willow close to the stream. At Leonard Creek one was caught about twenty feet from the stream by a rock on sandy soil, another on the immediate bank.

Three juvenals (nos. 7995, 7996 and 7998) were secured, the first two at Alder Creek (altitude 6000 feet) on July 16, and the third at the meadow on Duffer Peak (8500 feet), on August 1. On June 26 a female containing five embryos was secured at the head of Big Creek. On the next day one having mammary glands

(one pair pectoral and two abdominal) functioning, was collected at the same locality. A female containing seven embryos was obtained on June 30. The testes apparently do not become enough enlarged during the breeding season to be in evidence externally, although with other species this is not the case (see Seton, 1909, p. 592). Of the series secured, nine are males, and nine females.

Erethizon epixanthum Brandt.

Porcupine.

Status.—A portion of a skull of an *Erethizon* was picked up near our camp at the head of Big Creek, altitude 8000 feet. It includes only the middle of the skull, a portion of the rostral region, and the squamosal of one side, bearing a small piece of the zygomatic arch. The cheek teeth are all present.

Lacking pertinent material it is impossible to define the status of the Nevada porcupine with any degree of assurance. From the size of the skull and its geographical occurrence, there is a possibility that it will be found to be referable to *E. e. couesi*, which was described by Mearns (1897, p. 723) from Fort Whipple, Yavapai County, Arizona.

Distribution.—Porcupine tracks were seen at Big Creek Ranch, in Big Creek Cañon above the "Dugout Camp" and in Alder Creek Cañon. Fragments of skin, still bearing quills, were found at the head of Big Creek. Almost every resident reported porcupines as having been seen about the various ranches or in nearby cañons. Four were killed in the alfalfa at Big Creek Ranch during the haying season, July, 1909. The animals are not, however, numerous in the mountains. Every scheme essayed for their capture failed. They are probably present sparingly in the mountains and along streams on the nearby flats. It seems rather remarkable taking the season into account that the only signs of the actual presence of living porcupines were observed on the plains about the ranches.

Habits.—A small sapling which had been gnawed, apparently by a porcupine, was observed at the head of Big Creek. The track left by the animal as it slowly progresses over the ground is

peculiar, the animal evidently dragging itself heavily, leaving behind it the trail of the body with foot-marks on either side.

Sylvilagus nuttalli grangeri (Allen) (?).

Black Hills Cottontail.

Status.—The rabbits in our collection are more or less puzzling for several reasons. In the first place, lack of specimens of *Sylvilagus nuttalli grangeri* and *Sylvilagus nuttalli pinetis* in comparable pelage renders determination by direct comparison impossible. Then the localities from which our series come lie on the border line between the ranges of *Sylvilagus nuttalli nuttalli* and *Sylvilagus nuttalli grangeri*. The *nuttalli* group (Nelson, 1909, p. 199) is made up of three "not strongly marked" subspecies, so that the differences between *nuttalli* and *grangeri* are not great. As nearly as can be determined, our specimens are nearest *grangeri*. The measurements of *nuttalli* as given by Nelson (1909, p. 203) are, total length, 352 mm.; tail vertebrae, 44; hind foot, 89.8; ear from notch in dried skin, 55.7. Average measurements of five adults from northwestern Nevada taken by us are, total length, 353.2 mm. (max. 366, min. 348); tail vertebrae, 52.4 (max. 56, min. 46); hind foot, 89.4 (max. 95, min. 85); ear from notch in dried skin, 60 (max. 62, min. 58). In respect to length of ear and of tail vertebrae the specimens in question are near *grangeri*. Whereas in total length our specimens are nearest *nuttalli*, in coloration they are very definitely different from examples of that form from Modoc County, California, being of a distinctly lighter shade. There is great variation in total length in the northeastern California examples of *nuttalli*, so the apparent approximation in this measurement is not as significant as it might seem.

In the cranium of one specimen (no. 8264) the post-orbital process touches the skull for nearly one-fourth of its length. This is a variation in the direction of *pinetis*. This same specimen is an adult breeding female and is larger than the average of the series in all characters. It may exemplify sexual variation in size rather than a variation toward the other form. *Grangeri* is given by Nelson (1909, p. 204) as having the legs much

brighter rufous than *pinetis*. None of our specimens have this color as intensified as it is in two available specimens of *pinetis* in winter pelage from Mancos and Glenwood Springs, Colorado. The more modified color may be due in part to wear in the case of the Nevada specimens, but it cannot be entirely accounted for on this ground. They are lighter dorsally than the individuals of *pinetis* just mentioned, very probably approximating *grangeri*. A great difference in pelage is noticeable with respect to thickness of hair. The different stage in which the series are found must be taken into consideration, the two examples of *pinetis* exhibiting the winter coat, and our Nevada specimens the breeding pelage.

A few points may be noted wherein our specimens vary from the description of *nuttalli* given by Nelson (1909, p. 201). The ears are not definitely edged with black anteriorly except in one young male (no. 8290). Instead, a rather indistinct stripe of brown, a little lighter than seal brown, is present in nearly all of the specimens along the distal two-thirds of the front ear margin. In another male, an adult (no. 8263) the stripe becomes a still lighter brown. Juvenals of our series are somewhat darker than the adults. As previously remarked, too, the Nevada animals are distinctly different from *nuttalli* from northeastern California in general coloration dorsally, being paler and having more of a rufous admixture than a chestnut, as in the Modoc County, California, specimens of *S. n. nuttalli*.

Our *Sylvilagus*, as would be expected from Nelson's assertion (1909, p. 203) that "it is interesting to note that typical *S. nuttalli* has a distribution nearly coincident with that of *Lepus californicus wallawalla*," presents a problem exactly analogous to that of the series of jack rabbits secured by the Nevada Expedition (see below). The localities in which collecting was carried on lie on the line, in both cases, between two closely related and intergrading subspecies, and it could hardly be expected that either of our series would present the typical characters of either one. Whereas, however, the jack rabbit seems to incline definitely toward the subspecies inhabiting eastern Oregon rather than toward that found in eastern and southern Nevada, the reverse is true of the cottontail.

Distribution.—Cottontails were fairly common all over the desert flat and up to 6500 feet altitude, at least, in the Pine Forest Mountains. Cottontails were seen at Winnemucca, Amos, Quinn River Crossing, Big Creek Ranch, Big Creek Cañon (up to 5800 feet altitude), Alder Creek (to 6000 feet altitude), Alder Creek Ranch, and Leonard Creek (to 6500 feet altitude). These localities are all in Upper Sonoran. Specimens were collected as follows: Quinn River Crossing (4100 feet), 3; Big Creek Ranch (4350 feet), 5; Big Creek (5000 feet), 1; Virgin Valley (5000 feet), 1.

Habits.—We found cottontails to be much shyer than jack rabbits, nor were they nearly so common. More were observed and secured at Big Creek Ranch than at any other one locality. They were found indiscriminately in the willows along the river, and in the sage at no great distance from it. A cottontail observed at Big Creek Ranch crouched down close to the ground in a clump of willows and remained perfectly quiet, apparently seeking to escape observation. While I was hunting on a ridge near the ranch, at an altitude of about 5000 feet, I encountered a couple of *Sylvilagus*. I had just shot a *Sceloporus* from a rock. As I went to recover it, a cottontail jumped out and ran toward a bush at some little distance. A young juvenal (no. 8266) was found on another slope. I was able to get within a couple feet of it, for it seemed to consider itself safe while it was under a bush, regardless of the hunter's position, and remained stockstill. As soon as it found itself in the open it hurried to seek cover.

On a number of occasions the animals were seen in pairs. They ranged up to 6500 feet altitude on both the eastern and western slopes of the mountains, being found in the sagebrush and along ridges covered with mountain mahogany.

A very young male juvenal (no. 8301) was collected in Virgin Valley on May 23. Two were secured at Big Creek Ranch June 15 and 19, respectively (nos. 8266, 8268). A male taken June 3 at Quinn River Crossing is marked "testes large." On the same date individuals of the species were observed mating at this locality. Two pregnant females were obtained; no. 8264, Quinn River Crossing, June 4, containing seven embryos; and no. 8267, Big Creek Ranch, June 15, containing six embryos. Another, no.

8265, Big Creek Ranch, June 12, had evidently recently given birth to young, as the mammary glands were functioning. These facts show that there are no precise limits to the mating, gestation and suckling periods.

Lepus californicus wallawalla C. H. Merriam (?).

Washington Jack Rabbit.

Status.—It is rather difficult to determine definitely the exact status of our specimens from Quinn River Crossing and Virgin Valley. The reason for the difficulty lies in the probability of their being intergrades between *Lepus c. deserticola* and *Lepus c. wallawalla*. Our specimens are somewhat darker dorsally than *deserticola* from the Mohave and Colorado deserts. All of them have the distal black area on the posterior surface of the ears very definitely developed. The skulls have smaller bullae, and narrower jugals. The rounding of the skull, however, is not appreciably greater than in typical *deserticola*, and in the matter of measurements our series is a little closer to *deserticola* than to *wallawalla*.

Thus Nelson's statement (1909, p. 139) to the effect that in northwestern Nevada *deserticola* grades into the closely related *wallawalla*, is borne out by a study of our material. A female specimen (no. 8279) from Virgin Valley seems to be nearer the description of *wallawalla* than any of the others of the series.

Reference to Nelson's map of the distribution of the jack rabbits of the *Lepus californicus* group (1909, p. 127) will show that the specimens collected by us come from a locality between the plotted ranges of *Lepus californicus wallawalla* and *Lepus californicus deserticola*. As far as I can see the resemblance to *wallawalla* is more pronounced than to *deserticola*, and so our series is referred to that form. A corresponding intergradation between *Sylvilagus nuttalli nuttalli* and *S. n. grangeri* was found by us in this same region (see above).

Distribution.—The jack rabbit was observed at Winnemucca, Amos, Tregaskis Well, Quinn River Crossing, Big Creek and Alder Creek Ranches, and on Leonard Creek.

Specimens were collected as follows: Quinn River Crossing (4100 feet), 4; Virgin Valley (5000 feet), 2. They were seen

at the greatest elevation on Leonard Creek, where a couple were observed at 6500 feet altitude. They were fairly common between Winnemucca and Quinn River Crossing, and were very numerous about Big Creek Ranch. They are said to attain to such numbers during certain favorable years that they do a great deal of damage to the alfalfa. At intervals, however, as is commonly the case with jack rabbits, some disease or parasite kills them off by hundreds.

Zonally these records are from Upper Sonoran. The highest points at which the animals were seen are exposed sage-covered slopes, typical tongues of Upper Sonoran, bordered by Transition plants and animals.

Habits.—A number of hare forms were noted by our party. On May 14 a juvenal was jumped from one of simple construction under a sagebush near Amos, Nevada. This form was merely a depression relatively clear of debris and broken twigs. It was fairly well screened by the branches of the bush, and measured twelve by eighteen inches. Apparently some digging had been done in the construction of one form, which was a slight depression eighteen inches long by six inches wide. This form was found under a low desert plant. The grass in the immediate vicinity had been cropped. These two forms were typical of all those observed.

The lack of shyness of the jack rabbits impressed us immediately. Very often individuals would stop behind a bush, or even at times in the open, only a short distance away from the collector. This was especially noticeable about Big Creek Ranch, where they were more numerous than anywhere else. The animals would hardly take the trouble to get out of one's way, and it was sometimes almost impossible to frighten them into a run. On June 11 at Big Creek Ranch I almost walked up to an individual that was nibbling grass among the willows along the creek. It continued eating, ambling off at a comfortable pace after several minutes. In the heat of the day they seek the shade of the sagebrush.

Two males collected May 19 (nos. 8271 and 8272) had the enlarged testes indicative of breeding activity.

Lynx baileyi C. H. Merriam.

Wild Cat.

This species is apparently quite rare in the region explored. The first direct evidence of its presence was the observation of fresh tracks in a rocky gorge near our camp on Alder Creek at 6000 feet altitude, which could have been made by no other animal. The cowboys at Big Creek Ranch asserted that wild cats had been seen in Big Creek Cañon, and Mr. Matthew Price of the "Dugout Camp" also bore testimony to that effect. Mr. F. M. Payne of Quinn River Crossing reported their occurrence along the river in winter.

Although there is a slight possibility of error as to species, the wild cat of the region is probably referable to *baileyi*. The latter is included in the list of common mammals of the arid interior by Bailey (1908, p. 26), although no definite record stations are listed or cited.

Canis lestes C. H. Merriam.

Great Basin Coyote.

Status.—The two specimens taken are adult male and female respectively (nos. 8260, 8261). Their pelage is very much worn and so does not warrant a detailed account. So far as can be made out, with the few exceptions noted below, the coloration of our specimens accords with C. Hart Merriam's description of *lestes* (1897a, p. 25). Neither specimen has the broad black ruff on the throat, which is more whitish in color, sprinkled with a few dark brown hairs. The male has the hind feet buffy ochraceous instead of white. The color becomes lighter along the inner sides. This specimen has the tail tipped with black, but the darkening, instead of increasing uniformly toward the end, is located about a third from the base of the tail, which then becomes lighter, darkening gradually toward the tip. There is no black on the tail of the female. The ventral surface of the tail is white, the dorsal presents a stripe of liver brown or bay. This is rendered obscure in places by the wearing off of the hairs. The coloration of the female is much closer to Merriam's description than is that of the male.

CRANIAL MEASUREMENTS OF THREE SPECIES OF COYOTES.

All dimensions are in millimeters.

	Canis lestes			*Canis estor*			*Canis ochropus*			
	♂ adult no. 8260, U. C. Mus. Vert. Zool.	♀ adult no. 8261, U. C. Mus. Vert. Zool.	Type specimen, ♂ adult. Measurements given by C. H. Merriam‡	♂ adult, no. 4969, U. C. Mus. Vert. Zool.	♀ adult, no. 4971, U. C. Mus. Vert. Zool.	Type specimen, ♀ adult. Measurements given by C. H. Merriam	♂ adult, no. 8895, U. C. Mus. Vert. Zool.	♀ adult, no. 7067, U. C. Mus. Vert. Zool.	♂ adult, from Tracy, Calif. Measurements given by C. H. Merriam	♀ adult, from Tracy, Calif. Measurements given by C. H. Merriam
Basilar length of Hensel	166.1	161.0	166.0	158.8	155.4	155.0	175.1	160.4	174	167
Basal length*	178.9	174.1	170.0?	171.8	167.2	159.0?	187.8	174.6	177?	171?
Zygomatic width	98.0	93.2	102.0	87.3	84.2	89.0	95.0	93.3	94	94
Palatal length†	90.8	86.1	88.0	86.2	83.2	84.0	94.8	85.5	98	90
Mastoid width	61.1	58.7	62.0	56.8	53.7	57.0	60.9	58.4	62	59
Length of crown of upper carnassial	18.5	18.6	21.5	21.3	16.7	17.2	19.9	18.2	19	18

* Measured from most posterior point on occipital condyle, to most anterior portion of premaxillary.

† Measured from post-palatal notch to posterior margin of alveolus of middle incisor.

‡ The measurements given by C. H. Merriam appeared in the Proceedings of the Biological Society of Washington, Vol. XI, pp. 19-33, March 15, 1897. The question mark appearing after his measurements of basal length indicate the writer's uncertainty as to whether measurement was taken from the condyle to the posterior rim of the middle incisor, or to the anterior part of the premaxillary. It is assumed that the latter was the method used.

As will be seen from the table of cranial measurements, our specimens are referable to the species *lestes*. It will be apparent from the table that differences between the three western species of coyotes, *C. latrans*, *lestes*, and *ochropus*, are not great. Cranial characters, at least so far as available measurements go, do not serve any too clearly to distinguish them.

Distribution.—The species is probably to be found everywhere on the high desert plateau of Humboldt County. We first met with it between Tregaskis Well (stage station) and Quinn River Crossing. The species was noted at the following points in the Pine Forest Mountains: Big Creek Ranch, Big Creek Cañon, Duffer Peak (8400 feet), Alder Creek (6700 feet), and Leonard Creek (6500 feet). It was found commonly in both Upper Sonoran and Transition zones. A number were heard at Amos, Nevada, on the return trip.

Habits.—It is apparent that during the summer season a great many coyotes migrate to the mountains. We heard them several times while camped at an altitude of 8400 feet on the Duffer Peak meadow. One morning we missed "Cicero," a colt burro, whose mother we were using as a pack-animal. After an hour's search we discovered the little beast on a large marshy meadow a half-mile away. Two coyotes were sneaking about the border of the meadow.

The sheep herders complained very much of the coyotes. Almost nightly an immense bonfire for the protection of the sheep could be seen on some lonely ridge.

On the afternoon of July 18, about four o'clock, a lone coyote was seen on the large Alder Creek Meadow (altitude 6500 feet). It was skulking about among the range cattle and calves, apparently catching *Citellus oregonus*, of which there are large numbers on the meadow. The cattle paid absolutely no attention to it, though the calves seemed rather interested and would sniff at it curiously when it came near.

The animals were found to be rather sly, as usual. One coyote, as shown by its tracks, had walked about a setting of three no. 3 steel traps in a wash near Big Creek Ranch, had stepped into one, which did not go off, had walked about the bush upon which the bait was placed, but had not ventured to touch it. Then it

had wandered down the wash to the place where a badger had been caught a few days previously.

The observance of a juvenal coyote June 1 would lead to the conclusion that the young were born several months earlier. The female killed by us showed no signs of breeding. She possessed three pairs of pectoral and two of abdominal teats.

Taxidea taxus (Schreber).

American Badger.

Status.—Comparison of skulls of specimens of badgers taken in Nevada with the description of the skull of this species given by Elliot in his *Synopsis of North American Mammals* (1901, p. 320), the original description not being available, shows that they accord fairly well with it in all particulars. Perhaps the most important characters which differentiate it are the width of the occipital region and the degree of development of the lambdoidal and sagittal crests. In the skulls from northern Nevada the occipital region is very wide, the lambdoidal ridge is greatly developed, and the sagittal crest but slightly. In one specimen, an adult male (no. 8276), the snout and patch before the ears are dark brown, approaching the seal brown of Ridgway's *Nomenclature of Colors*, rather than black as given by Elliot (1901, p. 321). This author, by an obvious slip of the pen, refers to the patch *behind* the ears instead of *before* or *in front of*, them, there being no dark patch behind the ears.

The dimensions of no. 8276 are somewhat less than those given by Coues (1877, p. 261) for this species, which are: Length of head and body, twenty-four inches (609 mm.); length of tail, six inches (152 mm.); length of longest fore-claw, one and five-tenths inches (38 mm.). The same measurements taken of no. 8276 are respectively 580 mm., 145, and 30.

Both our specimens are evidently very old males, for the teeth are very much worn, especially in no. 8276. A skull of the California badger *Taxidea taxus neglecta* (no. 7076), collected by J. Grinnell at Tujunga Wash, San Fernando Valley, California, differs in that the skull is somewhat narrower throughout and is slightly more restricted in the interorbital region, but, contrary

to the general rule, the bony palate is shorter and the bullae are smaller than in the Nevada animals.

Measurements of the Two Skulls of *Taxidea taxus* from Humboldt County, Nevada.

	No. 8276	No. 8277
Length*	132.2	133.6
Basilar length of Hensel	119.2	119.9
Length of palate†	67.2	66.7
Zygomatic width	88.0	85.8
Mastoid width	86.7	80.0
Width of skull‡	40.2	38.3
Height of cranium immediately posterior of upper molar	38.9	40.0
Height of cranium at auditory bullae	58.4	58.5

* Measured from occipital condyle to most anterior point on premaxillary.

† Measured from post-palatal notch to posterior margin alveolus of middle incisor.

‡ Measured outside post-orbital processes.

Distribution.—Badgers were evidently common all over the plains region of northern Humboldt County. Burrows were seen at Amos, Quinn River Crossing, Big Creek Ranch, and on the flats in the Pine Forest Mountains up to 6500 feet. This level falls within Upper Sonoran. Our specimens were captured as follows: no. 8277, adult male, Big Creek Ranch (4350 feet), and no. 8276, adult male, Leonard Creek (6500 feet); both localities in the Pine Forest Mountains.

Probably *Taxidea taxus* is the species of the Great Basin. It is possible that its range adjoins that of *neglecta* somewhere along the line of the Sierra Nevada in California. However, more badger material is necessary before the status of the Great Basin species can be stated with absolute certainty.

Habits.—Places where badgers had evidently been digging for small mammals were frequently observed, the long claw marks being very distinct in the soil of the desert. The vaqueros are not friendly to these animals, for they say that it is very seldom that a professional cowboy is found who has not been thrown from his horse by a badger burrow.

The exact locality of capture of the first of the two specimens of badger secured was a little gulch leading out of the mountains near Big Creek Ranch. The other individual was caught

in a setting of steel traps in a cow path in the sagebrush on the broad Leonard Creek flat at an altitude of 6500 feet.

Putorius cicognani (Bonaparte).

Weasel.

Status.—On the morning of July 16, while we were camped at 6000 feet altitude on Alder Creek, a male of this species (no. 8222) was found in one of our rat-traps, which had been baited with oatmeal, not far from the stream near a large mass of rock.

This specimen, whose skull has been misplaced and so is not available at the present writing, was kindly examined by Dr. C. Hart Merriam and identified as belonging to the *cicognani* group. What the precise relations of *Putorius muricus* Bangs, described from Echo, El Dorado County, California (1899, p. 71) to the *cicognani* group are, cannot be determined with the material now available.

The specimen from Nevada seems to resemble *muricus* (Elliot, 1901, p. 434), more closely than it does any other weasel described to date known to the writer. For example, the tail is short, tip black; upperparts and tail, except black tip, are nearest the drab of Ridgway's *Nomenclature of Colors*, slightly tinged with chocolate; the underparts, hands, toes, and upper lip white; total length, 198 mm.; tail vertebrae, 49; hind foot, 26. The measurements of *muricus* are respectively, 220 mm., 60, 31. From a consideration of these facts, however, one is led to suggest that, if the Nevada animal is a member of the *cicognani* group, *muricus* is very probably intimately related to the same group. It may be that the Nevada animal represents a clearly defined unrecognized form inhabiting the Pine Forest Mountains alone or found in the Transition zone of the mountain ranges of the northern part of the Great Basin in general. However this may be, the present record definitely extends the range of the *cicognani* group (see C. H. Merriam, 1896, p. 5), to include the desert ranges of the Great Basin.

It is significant to note that the Nevada Expedition recorded two species of weasels in the Transition of the Pine Forest Mountains, belonging to two distinct groups, the small weasel to the

cicognani group (Boreal), and *arizonensis* belonging to the *frenatus* and *longicauda* series (Austral). These species are analogous in their comparative characteristics to *rixosus* and *arcticus* of the far north (see C. H. Merriam, 1896, p. 7), their habits probably being sufficiently divergent so that they occupy different niches in the economy of nature and so are able to live in the same region.

Putorius arizonensis Mearns.

Mountain Weasel.

Status.—The two specimens of mountain weasel collected by the Nevada Expedition (nos. 8220, 8221) were identified by Dr. C. Hart Merriam as belonging to this species. The specimens themselves are very dissimilar. Their data are as follows: no. 8220, female, July 13, 1909, 7000 feet, Alder Creek, Pine Forest Mountains, Nevada; no. 8221, adult male, July 23, 1909, 8000 feet, head of Big Creek, Pine Forest Mountains, Nevada. The first measures: total length, 311 mm.; length of tail vertebrae, 117; hind foot, 35, while the second is, respectively, 326, 98, and 37. Measurements of *arizonensis* as given in C. H. Merriam's characterization of it (1896, p. 24) are, respectively, total length, 385 mm.; tail vertebrae, 144; and hind foot, 44.5. Thus neither of our specimens is very close to the average of "specimens from the Rocky Mountains" as measured by him.

An adult male specimen of *arizonensis* (no. 2167) collected by Harry S. Swarth on July 23, 1908, in the San Jacinto Mountains (8000 feet altitude), southern California, is at hand, and, together with the two specimens from Nevada, exemplifies the wide range of intraspecific variation. In the California animal and in the male from Nevada the ventral parts are in coloration a shade intermediate between buff and ochraceous buff; the California animal presents a slightly paler tone, but has more yellowish ventrally on the neck. In the female from Nevada the lower surface is straw yellow. This animal has the proximal third of the tail yellow ventrally, and a considerably larger black tip to the tail. The chin is white in all three specimens. The throat also is white in the two Nevada specimens, but the buffy

yellowish of the neck and region in front of the forelegs encroaches on it in the San Jacinto animal. The dorsal coloration is practically identical (slightly darker in the female) in the two Nevada specimens, being of a uniform shade approximating vandyke brown. The southern California animal is much paler. The upper lip in the Pine Forest Mountain animals is white all around, as given by C. H. Merriam for *arizonensis* (1896, p. 22). But there is no white in the San Jacinto animal except for a good-sized patch just dorsal of the corner of the mouth. This specimen, as stated by Merriam for Sierran animals, shows a tendency to approach *xanthogenys*. There is a broad streak of white on the sides of the face reaching up to a line drawn back from the corner of the eyes, and a white area between the eyes. These two marks are lacking in the Nevada specimens. All three animals exhibit the small size which is said to be characteristic of specimens of *arizonensis* from the Sierras as compared with those from the Rocky Mountains. The female animal from Nevada has a longer tail than either of the males, although both of the latter are larger in every other respect.

Distribution.—The species *arizonensis* is probably quite generally distributed in the Transition zone of the Pine Forest Mountains. We were unable to obtain evidence of the presence of the animals in Upper Sonoran though this would necessarily be implied by Bailey (1908, p. 30), who includes the mountain weasel in his list of mammals of the arid interior. The present records show that in all probability Great Basin mountain ranges having the Transition zone represented on their slopes will be found to be inhabited by this species of weasel, so that the geographic distribution of *arizonensis*, instead of being the Sierra Nevada and Rocky Mountain systems only, will include isolated mountain ranges (and probably nearby plains to some extent), in the Great Basin also.

Habits.—Weasels were several times observed at the head of Big Creek (altitude 8000 feet). They appeared only in the early morning or late evening, and were apparently attracted to the vicinity of our camp by the bodies of birds and mammals which had been thrown out after skinning. Commonly the animals were seen among the logs in the immediate vicinity of the

stream. Although not shy, any sudden movement caused their rapid disappearance, either through their slipping into some hole in a rotten log or by concealment in nearby vegetation. A female weasel was shot near the stream not far from our 7000 foot camp on Alder Creek. It was carrying the body of a chipmunk which had been thrown away by us after being skinned. A white-crowned sparrow was pursuing the animal, although it had given no observable provocation.

Mr. Matthew Price asserts that weasels assume a white winter pelage; this is to be expected, as the snowfall in these mountains is very heavy and all the snow does not melt till late in the summer.

Sorex palustris navigator (Baird).

Navigator Shrew.

Status.—Although we trapped in the immediate vicinity of all the mountain streams on which we camped, we found only one species of shrew, *Sorex p. navigator*. Of this species we captured two adult male specimens (nos. 7881, 7882). These were taken in the same trap, one on July 22, and the other two days later, at the head of Big Creek (altitude 8000 feet) in the Transition life-zone. The trap was baited with oatmeal, and set at the very edge of a small stream among fallen branches and vegetation. In one case the animal had pulled the trap into the running water.

Comparison of our specimens from the Pine Forest Mountains with individuals of *S. p. navigator* from Mount Shasta, California, and Lake Moraine, Colorado, leaves no doubt that they are referable to this subspecies.

One of our specimens (no. 7881) seems to be abnormal in several respects. Dorsally it has a distinct grayish cast to its pelage, instead of the very dark, almost black coat of the other examples. This may be due to the fact that, in spite of the date, no. 7881 is not in the same state of pelage. Its tail is hardly haired at all, widens toward the tip, and presents the same curious scaly appearance that is evident on the ventral surface of the feet. This scaly appearance continues to the end of the tail, and is plainly discernible dorsally and ventrally.

Upon looking up Baird's original description of *navigator* (1857, p. 11) it becomes apparent that one character ascribed by him to the subspecies does not hold in our specimens, nor in those of which measurements are given by C. H. Merriam (1895b, p. 93). Baird asserts that the tail is considerably longer than the body, evidently meaning head and trunk together, or total length minus the length of the tail vertebrae. Elliot repeats the statement (1901, p. 379). In all the specimens in the Museum, and in all those considered by C. H. Merriam (1895b, p. 93) except the type, which is a much shrunken alcoholic, the length of the tail vertebrae is exceeded by that of the head and trunk.

Examination of the first upper molars shows the specimens to belong to the subgenus *Neosorex* (see C. H. Merriam, 1891, p. 35). They lack the distinct secondary tubercle which is said to characterize the subgenus *Atophyrax*, but seem to possess a very definite sulcus separating the antero-internal cusp of the first upper molar from the posterior triangular cusp formed by the cingulum. This is given as one of the characters of *Atophyrax*. Probably there is considerable variation in this regard.

In his "Synopsis of the American Shrews of the Genus Sorex" (1895b, p. 92) Merriam examined no specimens from Nevada. But their discovery in the Pine Forest Mountains might well have been anticipated, as record stations are present to the eastward in Nevada and to the westward in California.

Myotis lucifugus longicrus (True).
Long-legged Bat.

A single specimen referable to this form was shot at the Duffer Peak meadow on the evening of July 31, 1909 (8400 feet). Five or six bats were flying about the lake, and occasionally one would skim along the surface of the water. It seemed to be characteristic of these bats to come out very late in the evening.

Miller (1897, p. 65) in his list of material of this form examined, records a skin from the Cottonwood Range, Nevada. This is east and south of the Pine Forest Mountains, but not more than fifty miles distant. The present is the first record known to the writer from the latter mountains.

Antrozous pallidus pallidus (LeConte).

Pallid Bat.

A small company of bats, which proved to be of this species, was discovered in the wall of a butte near Quinn River Crossing (4100 feet) on May 18. The pallid bat is said by Miller (1897, p. 43) to inhabit the Lower Austral zone. The present record is very definitely from the Upper Austral, and so is significant in this connection. The same author examined specimens from Amargosa Desert, in southern Nye County, and from the "Timpahute" (or Tem Piute) Mountains of Lincoln County. These stations are both in southern Nevada. Our captures in northern Humboldt County establish the northernmost record of the species known to the writer.

Bats were heard squeaking in a small crevice in a perpendicular wall of lava twenty-five feet from the base of the cliff, the opening of which was about eight inches in width. Directly below the opening there was a small white streak of excrement, but other than this there were no visible signs of its being occupied. A charge of light shot was fired into the crevice and after five minutes about ten bats came tumbling out, still squeaking. They flew about the cliff in a bewildered manner, finally disappearing into near-by cracks.

LITERATURE CITED.

Allen, J. A.

1890. A Review of Some of the North American Squirrels of the Genus *Tamias*. Bull. Am. Mus. Nat. Hist., vol. 3, no. 1, pp. 45-116.

1894. Cranial Variations in *Neotoma micropus* Due to Growth and Individual Differentiation. Bull. Am. Mus. Nat. Hist., vol. 6, pp. 233-246, pl. IV.

1895a. On the Species of the Genus *Reithrodontomys*. Bull. Am. Mus. Nat. Hist., vol. 7, pp. 107-143.

1895b. On a Collection of Mammals from Arizona and Mexico, made by Mr. W. W. Price, with Field Notes by the Collector. Bull. Am. Mus. Nat. Hist., vol. 7, pp. 193-258, figs. 1-17.

1895c. Description of New American Mammals. Bull. Am. Mus. Nat. Hist., vol. 7, pp. 327-340.

Bailey, V.

1900. Revision of American Voles of the Genus *Microtus*. North American Fauna, no. 17, pp. 1-88, pls. I-V, figs. 1-17.

1908. Harmful and Beneficial Mammals of the Arid Interior, with special reference to the Carson and Humboldt Valleys, Nevada. U. S. Dept. of Agriculture, Farmers' Bulletin 335, pp. 1-31, figs. 1-9.

Baird, S. F.

1855. Characteristics of Some New Species of North American Mammalia, Collected Chiefly in Connection with the U. S. Surveys of a Railroad Route to the Pacific. Proc. Acad. Nat. Sci. Phila., vol. 7, pp. 333-336.

1857. Mammals of North America; the Descriptions of Species based chiefly on the Collections in the Museum of the Smithsonian Institution. U. S. Pac. R. R. Explorations and Surveys, vol. 8, part II, pp. i-xxxiv, 1-764, pls. I-LXXXVII.

Bangs, O.

1899. Descriptions of Some New Mammals from Western North America. (Talpidae, Mustelidae, Sciuridae, Muridae, Geomyidae). Proc. New England Zool. Club, vol. 1, pp. 67-72.

Coues, E.

1877. Fur Bearing Animals, a Monograph of North American Mustelidae. U. S. Geol. Survey of the Terr., Misc. Publ., no. 8, pp. i-xiv, 1-348, pls. I-XX.

1903. Key to North American Birds, 2 vols. Fifth Edition. vol 1, frontispiece, pp. i-xli, 1-535, figs. 1-353.

Elliot, D. G.

1901. A Synopsis of the Mammals of North America and the Adjacent Seas. Field Columbian Museum Publ. 45. Zool. Series, vol. 2, pp. i-xv, 1-471, pls. I-XLIX, figs. 1-94.

1905. A Check List of Mammals of the North American Continent, the West Indies and the Neighboring Seas. Field Columbian Museum Publ. 105. Zool. Series, vol. 6, pp. i-iv, 1-761, frontispiece.

Goldman, E. A.

1910. Revision of the Wood Rats of the Genus *Neotoma*. North American Fauna, no. 31, pp. 1-124, pls. I-VIII, figs. 1-14.

Grinnell, J.

1908. The Biota of the San Bernardino Mountains. Univ. Calif. Publ. Zool., vol. 5, no. 1, pp. 1-170, pls. 1-24.

Kennicott, R.

1863. Description of Four New Species of *Spermophilus*, in the Collections of the Smithsonian Institution. Proc. Acad. Nat. Sci. Phila., vol. 15, pp. 157-158.

Mearns, E. A.

1897. Descriptions of Six New Mammals from North America. Proc. U. S. Nat. Mus., vol. 19, pp. 719-724.

1907. Mammals of the Mexican Boundary of the United States. U. S. Nat. Mus., Bull. no. 56, part 1, pp. i-xv, 1-530, pls. I-XIII, figs. 1-126.

Merriam, C. H.

1889. Description of a New Species of Ground Squirrel from the Arid Lands of the Southwest. North American Fauna, no. 2, pp. 19-21.

1890a. Descriptions of Fourteen New Species and One New Genus of North American Mammals. North American Fauna, no. 2, pp. i-v, 1-52, pls. I-VIII, figs. 1-7.

1890b. Results of a Biological Survey of the San Francisco Mountain Region and Desert of the Little Colorado, Arizona. North American Fauna, no. 3, pp. 1-136, pls. I-XIII, maps 1-5.

1891. Results of a Biological Reconnaissance of South-central Idaho. North American Fauna, no. 5, pp. i-vii, 1-132, pls. I-IV, figs. 1-4.

1894a. Descriptions of Eight New Pocket Mice (Genus *Perognathus*). Proc. Acad. Nat. Sci. Phila., vol. 46, pp. 262-268, figs. 1-7.

1894b. Preliminary Descriptions of Eleven New Kangaroo Rats of the Genera *Dipodomys* and *Perodipus*. Proc. Biol. Soc. Wash., vol. 9, pp. 109-116.

1895a. Monographic Revision of the Pocket Gophers, Family Geomyidae (exclusive of the species of *Thomomys*). North American Fauna, no. 8, pp. 1-258, frontispiece, pls. 1-19, maps 1-4, figs. 1-71.

1895b. Synopsis of the American Shrews of the Genus *Sorex*. North American Fauna, no. 10, pp. 57-98, pls. IV-XII.

1896. Synopsis of the Weasels of North America. North American Fauna, no. 11, pp. 1-44, frontispiece, pls. I-V, figs. 1-16.

1897a. Revision of the Coyotes or Prairie Wolves, with Descriptions of New Forms. Proc. Biol. Soc. Wash., vol. 11, pp. 19-33.

1897b. Descriptions of Eight New Pocket Gophers of the Genus *Thomomys*, from Oregon, California, and Nevada. Proc. Biol. Soc. Wash., vol. 11, pp. 213-216.

1897c. Notes on the Chipmunks of the Genus *Eutamias* occuring west of the East Base of the Cascade-Sierra System, with Descriptions of New Forms. Proc. Biol. Soc. Wash., vol. 11, pp. 189-212.

1898. Descriptions of Six New Ground Squirrels from the Western United States. Proc. Biol. Soc. Wash., vol. 12, pp. 69-71.

1899. Results of a Biological Survey of Mount Shasta, California. North American Fauna, no. 16, pp. 1-179, pls. I-V, figs. 1-46.

1901. Descriptions of Twenty-three New Pocket Gophers of the Genus Thomomys. Proc. Biol. Soc. Wash., vol. 14, pp. 107-117.

Miller, G. S., Jr.

1896. Genera and Subgenera of Voles and Lemmings. North American Fauna, no. 12, pp. 1-84, pls. I-III, figs. 1-40.

1897. Revision of the North American Bats of the Family Vespertilionidae. North American Fauna, no. 13, pp. 1-140, pls. I-III, figs. 1-40.

Nelson, E. W.

1909. The Rabbits of North America. North American Fauna, no. 29, pp. 1-314, pls. I-XII, figs. 1-19.

Osgood, W. H.

1900. Revision of the Pocket Mice of the Genus *Perognathus*. North American Fauna, no. 18, pp. 1-72, pls. I-IV, figs. 1-15.

1909. Revision of the Mice of the American Genus *Peromyscus*. North American Fauna, no. 28, pp. 1-285, pls. I-VIII, figs. 1-12.

Preble, E. A.

1899. Revision of the Jumping Mice of the Genus *Zapus*. North American Fauna, no. 15, pp. 1-42, pl. I, figs. 1-4.

Seton, E. T.

1909. Life-histories of Northern Animals, an Account of the Mammals of Manitoba, vol. 1, pp. i-xxx, 1-673, figs. 1-182, pls. I-XLVI, maps 1-38.

Taylor, W. P.

1910. Two New Rodents from Nevada. Univ. Calif. Publ. Zool., vol. 5, no. 6, pp. 283-302, pls. 27-29.

Transmitted June 28, 1910.

Vol. 3.

1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
   Nos. 3 and 4 in one cover ..... .15
5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
   Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
    Nos. 9 and 10 in one cover. January, 1907 ..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
    Index, pp. 369-383.

Vol. 4.

1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
   Nos. 6 and 7 in one cover. April, 1908 ..... .50
   Index, pp. 395-400.

Vol. 5.

1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
   Nos. 6 and 7 in one cover. February, 1910 ..... .20

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.
9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.
10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
    Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15
11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.
12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
    Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
    Index, pp. 429-440.

Vol. 6.
1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10
2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20
3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30
4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50
5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10
6. The Life History of *Trypanosoma dimorphon*, Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50
7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35
8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10
9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15
10. (XXX) Biological Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.
11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
    Nos. 10 and 11 in one cover. August, 1910 ..... .20
12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60
13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25
14. (XXXIII) Third Report on the Copepoda of the San Diego Region, by Calvin Olin Esterly. Pp. 313-352; plates 26-32. February, 1911 ..... .40
15. The Genus *Gyrocotyle*, and Its Significance for Problems of Cestode Structure and Phylogeny, by Edna Earl Watson. Pp. 353-468; plates 33-48. June, 1911 ..... 1.00

Vol. 7.
1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10
2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50
3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05
4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15
5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05
6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05
7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. Pp. 205-307. June, 1911 ..... 1.00

Vol. 8.
1. The Vertical Distribution of *Eucalanus elongatus* in the San Diego Region during 1909, by Calvin O. Esterly. Pp. 1-7. May, 1911 ..... .10

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 8, pp. 309-311 August 24, 1911

DESCRIPTION OF A NEW SPOTTED TOWHEE FROM THE GREAT BASIN

BY
J. GRINNELL

Smithsonian
AUG 30
National Mu

BERKELEY
THE UNIVERSITY PRESS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ,
LEIPZIG.

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

R. FRIEDLAENDER & SOHN,
BERLIN.

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25
Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)
Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25
1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.
Nos. 1 and 2 in one cover ..... .60
3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.
Nos. 6 and 7 in one cover ..... .25
8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25
Index, pp. 369-382.

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 8, pp. 309-311 August 24, 1911

DESCRIPTION OF A NEW SPOTTED TOWHEE FROM THE GREAT BASIN

BY
J. GRINNELL
(Contribution from the Museum of Vertebrate Zoology of the University of California)

Some spotted towhees were obtained by the expedition sent by the Museum of Vertebrate Zoology of the University of California in the early spring of 1910 to the lower Colorado Valley between Needles and Yuma. In attempting to identify these towhees it was found that they were quite unlike the *Pipilo maculatus montanus*, resident in the mountains to the eastward in Arizona, and yet they clearly differed from the *P. m. megalonyx*, resident in the Sierran and San Diegan districts of California. Casting about for comparable specimens the fact was brought out that the Colorado River birds were practically identical with examples representing a hitherto unnamed form and inhabiting in summer portions of the Great Basin region, at least of northern Nevada, eastern Oregon, and northeastern California. The Colorado Valley birds were thus evidently winter visitants from that region and not from any nearer locality, as far as available material indicated. The race may be called

Pipilo maculatus curtatus, new subspecies

Nevada Towhee

TYPE.—Male adult; no. 9151, Univ. Calif. Mus. Vert. Zool.;

Big Creek Ranch, alt. 4350 feet, base of Pine Forest Mts., Humboldt County, Nevada; June 16, 1909; collected by C. H. Richardson, Jr.

Distinguishing Characters.—Most nearly like *P. m. montanus* Swarth, from which it differs in shorter wing, much shorter tail, and slightly darker coloration; differs from *P. m. arcticus* (Swainson) in darker colors, slightly longer tail and hind-toe-and-claw; differs from *P. m. megalonyx* in much greater extent of white markings, in paler colors, smaller bill, and much shorter hind-toe-and-claw.

Range.—Summer specimens examined from: Pine Forest Mountains, Humboldt County, Nevada, 3; Warner Mountains, Modoc County, California, 3; John Day River, Wheeler County, Oregon, 2; Camp Harney, Harney County, Oregon, 1. Winter specimens from lower Colorado Valley, in southeastern California, 3.

Description of Type.—Whole head, neck, and chest black, the latter abruptly defined against white of median lower surface. Sides and flanks tawny with a line of indistinct dusky streaks at line of demarcation against median white area; crissum pale ochraceous; whole dorsum, wings and tail black, except at ends and margins of flight-feathers, which are brownish, evidently as a result of fading; rump, and to a less extent the back, slightly mixed with olive gray; outer webs of 8th to 5th primaries narrowly but distinctly edged with white for a space of about 10 mm., beginning outwardly 31 mm. from tip and running backwards on the successive feathers, thus forming an oblique white patch on closed wing; carpal edge, lining of wing, and very narrow edging of basal portion of first primary white (it is evident that some white edgings have been removed by wear); spots averaging 4 mm. long, on outer webs at tips of feathers of greater and median wing coverts; scapulars and to a successively less extent the lateral interscapulars margined on their outer webs with white. Outer rectrix with outer web uninterruptedly white 43 mm. from tip, thence extending farther towards the base as a diminishing white edging; inner web of outer rectrix white for a space 30 mm. long; next feather with

white on outer web 16.5 from tip, on inner web, 24 from tip; third rectrix with white patch on inner web, 15 mm. long; bill black; feet dull flesh color; claws blackish; tarsus 28 mm.; middle toe and claw, 25; hind toe and claw, 18.5; culmen, 12.9; bill from nostril, 10; gonys, 9; depth of bill at base, 8.6; wing, 86.4; tail, 96.4.

Remarks.—The above description should be compared in detail with the original account of *P. m. montanus*, in which are also given comparative measurements of series of the various forms (see H. S. Swarth, 1905, p. 173). The very much shorter tail and wing of *curtatus* is alone sufficient ground for its recognition as separate from *montanus*. It is proper to state that these differences are exhibited in the table of measurements of towhees from different localities given by Ridgway (1901, p. 416). The large extent of the white markings and the much shorter hind toe and claw readily distinguish *curtatus* from *megalonyx*. *P. m. montanus* is, according to Swarth (1905, p. 173), permanently resident in the high mountains of Arizona and New Mexico. *P. m. curtatus* is evidently a migratory form of rather sparse distribution in the west central portion of the Great Basin region, north probably into eastern Washington. The specimens at hand, as shown in the above statement of range, agree closely in essential characters, sex considered, with the description of the type.

LITERATURE CITED

Ridgway, R.

1901. The birds of North and Middle America. Bull. U. S. Nat. Mus., no. 50, xxx, 715, 20 pls.

Swarth, H. S.

1905. *Atratus* versus *megalonyx*. Condor, 7, pp. 171-174, 1 text fig.

Vol. 3. 1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25

2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30

3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.

4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.
Nos. 3 and 4 in one cover ..... .15

5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906 ..... .35

6. (XIII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.

7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.

8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
Nos. 6, 7, and 8 in one cover. December, 1906 ..... .35

9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.

10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
Nos. 9 and 10 in one cover. January, 1907 ..... .25

11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75

12. Biological Studies on Corymorpha. II. The Development of *C. palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50

13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50

14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907 ..... .25
Index, pp. 369-383.

Vol. 4. 1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907 ..... .50

2. (XVIII) Behavior of the Starfish *Asterias forreri* de Loriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907 ..... 1.00

3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908 ..... .50

4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30

5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00

6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.

7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
Nos. 6 and 7 in one cover. April, 1908 ..... .50
Index, pp. 395-400.

Vol. 5. 1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00

2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75

3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05

4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05

5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909 ..... .05

6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.

7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
Nos. 6 and 7 in one cover. February, 1910 ..... .20

---

* Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.
9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.
10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15
11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.
12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6.
1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10
2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20
3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30
4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50
5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10
6. The Life History of *Trypanosoma dimorphon* Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50
7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35
8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10
9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15
10. (XXX) Biological Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.
11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20
12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60
13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25
14. (XXXIII) Third Report on the Copepoda of the San Diego Region, by Calvin Olin Esterly. Pp. 313-352; plates 26-32. February, 1911 ..... .40
15. The Genus *Gyrocotyle*, and Its Significance for Problems of Cestode Structure and Phylogeny, by Edna Earl Watson. Pp. 353-468; plates 33-48. June, 1911 ..... 1.00

Vol. 7.
1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10
2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50
3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05
4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15
5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05
6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05
7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. Pp. 205-307. June, 1911 ..... 1.00
8. Description of a New Spotted Towhee from the Great Basin, by J. Grinnell. Pp. 309-311. August, 1911 ..... .05

Vol. 8.
1. The Vertical Distribution of *Eucalanus elongatus* in the San Diego Region during 1909, by Calvin O. Esterly. Pp. 1-7. May, 1911 ..... .10
2. New and Rare Fishes from Southern California, by Edwin Chapin Starks and William M. Mann. Pp. 9-19, 2 text-figures. July, 1911 .10

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 9, pp. 313-318 October 9, 1911

DESCRIPTION OF A NEW HAIRY WOODPECKER FROM SOUTH-EASTERN ALASKA

BY
H. S. SWARTH

Smithsonian Institution
OCT 16 1911
National Museum

BERKELEY
THE UNIVERSITY PRESS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ, LEIPZIG.

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology.

E. FRIEDLAENDER & SOHN, BERLIN.

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Vol. 1.
1. The Hydroida of the Pacific Coast of North America, by Harry Beal Torrey. Pp. 1-104; plates 1-11. November, 1902 ..... $1.00
2. A Case of Physiological Polarization in the Ascidian Heart, by Frank W. Bancroft and C. O. Esterly. Pp. 105-114. April, 1903 ..... .10
3. Embryology and Embryonic Fission in the Genus Crisia, by Alice Robertson. Pp. 115-156, plates 12-15. June, 1903 ..... .50
4. Correlated Protective Devices in some California Salamanders, by Marion E. Hubbard. Pp. 157-170, plate 16. November, 1903 ..... *
5. Studies on the Ecology, Morphology and Speciology of the Young of some Enteropneusta of Western North America, by William E. Ritter and B. M. Davis. Pp. 171-210, plates 17-19. February, 1904 ..... .50
6. Regeneration and Non-Sexual Reproduction in *Sagartia davisi*, by Harry Beal Torrey and Janet Ruth Mery. Pp. 211-226, 7 text-figures. May, 1904 ..... .15
7. The Structure and Regeneration of the Poison Glands of Plethodon, by C. O. Esterly. Pp. 227-268, plates 20-23. June, 1904 ..... 1.00
8. The Distribution of the Sense-organs in *Microscolex elegans*, by John F. Bovard. Pp. 268-286, plates 24-25. December, 1904 ..... .50
9. Some New Tintinnidae from the Plankton of the San Diego Region, by Charles A. Kofoid. Pp. 287-306, plates 26-28. July, 1905 ..... .25

Index, pp. 307-317.

Vol. 2. (Contributions from the Laboratory of the Marine Biological Association of San Diego.)

Introduction. A General Statement of the Ideas and the Present Aims and Status of the Marine Biological Association of San Diego, by William E. Ritter, Director of the Station. Pp. i-xvii. 2 Maps .25

1. The Hydroids of the San Diego Region, by Harry Beal Torrey. Pp. 1-43. 22 text figures. December, 1904.
2. The Ctenophores of the San Diego Region, by Harry Beal Torrey. Pp. 45-51, plate 1. December, 1904.

Nos. 1 and 2 in one cover ..... .60

3. The Pelagic Tunicata of the San Diego Region, excepting the Larvacea, by William E. Ritter. Pp. 51-112, plates 2-3. 31 text-figures. January, 1905 ..... .65
4. The Pelagic Copepoda of the San Diego Region, by C. O. Esterly. Pp. 113-233, 62 text figures. September, 1905 ..... 1.25
5. The Non-encrusting Chilostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 235-322, plates 4-16. December, 1905 ..... 1.00
6. Differentiation in Hydroid Colonies and the Problem of Senescence, by Harry Beal Torrey. Pp. 232-332, 4 text-figures. December, 1905.
7. The Behavior of Corymorpha, by Harry Beal Torrey. Pp. 333-340, 5 text-figures.

Nos. 6 and 7 in one cover ..... .25

8. Dinoflagellata of the San Diego Region. I. On Heterodinium, a New Genus of the Peridinidae, by Charles Atwood Kofoid. Pp. 341-368, plates 17-19. January, 1906 ..... .25

Index, pp. 369-382.

Vol. 3.
1. Some Observations on the Nervous System of Copepoda, by C. O. Esterly. Pp. 1-12, plates 1-2. January, 1906 ..... .25
2. (IX)* Ostracoda of the San Diego Region. 1. Halocypridae, by Chancey Juday. Pp. 13-38, plates 3-7. April, 1906 ..... .30
3. (X) The California Shore Anemone, *Bunodactis xanthogrammica*, by Harry Beal Torrey. Pp. 41-46, plate 8, April, 1906.
4. (XI) Sexual Dimorphism in Aglaophenia, by Harry Beal Torrey and Ann Martin. Pp. 47-52, 9 text-figures. April, 1906.

Nos. 3 and 4 in one cover ..... .15

* Supply limited; sold only with complete volumes.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 9, pp. 313-318 October 9, 1911

DESCRIPTION OF A NEW HAIRY WOODPECKER FROM SOUTH-EASTERN ALASKA

BY

H. S. SWARTH

(Contribution from the Museum of Vertebrate Zoology of the University of California)

The recent acquisition by this Museum of a series of *Dryobates villosus harrisi* from Vancouver Island (collected by the Museum's expedition to Vancouver Island during the summer of 1910), served to draw my attention to the quite different appearance of the hairy woodpeckers from southeastern Alaska, which I had previously referred to that race (1911, p. 66). My interest was further aroused by Mr. Oberholser's "Revision of the Hairy Woodpeckers" (1911, p. 616) in which he refers birds from Prince of Wales Island to the Queen Charlotte Islands form, *D. v. picoideus*, and comments upon the uniformity in size and color exhibited by the race *harrisi* throughout its range. I had examined one specimen of *picoideus* and could not see that any of my Alaskan birds approached it very closely. The individuals composing the series did show some variation, however, principally in the coloration of the lower surface of the body, but those which might be considered as exhibiting an inclination toward *picoideus* evinced it partly in the darker coloration below

—in which respect they also became more nearly like typical *harrisi*. Furthermore, although I had but a single specimen from Prince of Wales Island, I could not believe that the southern part of that island possessed one strongly marked form, while the northern part, and islands so closely adjacent that a stone can almost be tossed across the intervening channels, possessed another.

Under the circumstances I preferred to consider the Alaskan bird as *harrisi*, for the majority of specimens certainly did not exhibit the striking and distinctive features of *picoideus*, while the variation shown by the series made me reluctant to name it as a distinct subspecies.

The series at hand from Vancouver Island, however (which may be considered as typical *harrisi*), shows plainly that, though the Alaskan birds differ among themselves, they are, throughout this variation, quite different from the darker, more southern race.

I wrote to Mr. Ridgway, outlining my views here given, as of possible interest in his forthcoming work on the group, and it is at his suggestion, coupled with generously furnished information relative to the pertinent material he had himself examined, and to his proposed treatment of the hairy woodpeckers of the northwest coast, that I am proposing the formal recognition of this subspecies.

The peculiarities of the Sitkan hairy woodpecker have been noted by other writers (see Jenkins, 1906, p. 168; Grinnell, 1909, p. 216; Oberholser, 1911, p. 616), but the evident scarcity in collections of material from this region has prevented the detection of the extent and constancy of the distinctive characters of the race.

It is noteworthy that these characters are exactly comparable to the ones distinguishing the Valdez downy woodpecker (*Dryobates pubescens glacialis*) from the Puget Sound form, *D. p. gairdneri*, thus affording another instance of the parallel development of *Dryobates villosus* and *D. pubescens* in the same general regions.

The new race may be known as

Dryobates villosus sitkensis, subsp. nov.

Sitka Hairy Woodpecker.

Type: Male adult; no. 9739, Univ. Calif. Mus. Vert. Zool.; Etolin Island, Alaska, July 6, 1909; collected by H. S. Swarth; original number 7762.

Distinguishing Characters: Differs from *D. v. harrisi* mainly in the very much paler, less smoky hue of the lower parts, and the more buffy coloration of the nasal tufts. Somewhat like *D. v. picoideus*, but paler colored below, and lacking the barred rectrices of that race.

Range: Southeastern Alaska: the islands of the Alexander Archipelago, and the narrow strip of mainland coast lying west of the coast range, and south of the Taku River.

Description of Type: Upper parts generally, sides of head and neck, a malar stripe, wings and middle tail feathers, black; occipital band scarlet; a broad rictal stripe, all of the two outer rectrices (including the dwarfed outermost one), most of the third, and a portion of the fourth, throat, breast and abdomen, whitish, suffused with very light smoky brown, this least apparent on the flanks, lower abdomen, and lower tail coverts. Superciliary stripe, and a broad dorsal stripe white, the latter somewhat interrupted and broken by spots and imperfect bars of black. White spots on the inner webs of primaries and secondaries, and small white spots on outer webs of the same (except innermost secondaries). Some small white spots on the lesser wing coverts, and a very few on the middle coverts also, the latter almost entirely concealed. Nasal tufts yellowish buff, in decided contrast to the white rictal and supereiliary stripes adjoining.

Remarks: There appear to be some slight sexual differences, for the darker specimens (with one exception) are males, and the palest are females. It is rather curious that, although *sitkensis* is the paler form, it should have the nasal tufts buffy, in distinct contrast to the white superciliary and rictal stripes, whereas in the otherwise darker colored *harrisi* they are paler than in *sitkensis*, and concolor with the adjoining head markings.

Specimens from Prince of Wales Island have been referred to *D. v. picoideus*, mainly because of the restricted and broken white dorsal area, but the hairy woodpeckers from this and adjacent islands have not the barred rectrices, nor, as a rule, any markings on the lateral under parts, and should not be classed with that form.

There are at hand fourteen examples of the Sitkan hairy woodpecker, from the following localities: Admiralty Island, four; Chichagof Island, one; Baranof Island, one; Prince of Wales Island, one; Etolin Island, two; Coronation Island, one; Dall Island, one; Wrangel Island, one; Boca de Quadra, two.

There are six adult males. Two of these, one from Dall and one from Admiralty Island, both taken at the end of May, are closely similar, with the ventral coloration strongly suffused with buffy, the dorsal stripe narrow and broken with black markings, and the flanks distinctly barred; while two others (one from Sitka, the other from Etolin Island, both shot in July), have the dorsal stripe broader, more purely white and less checkered, the lower parts with less of the buffy suffusion, and the flanks unmarked. The remaining two males, one from Chichagof, and the other from Admiralty, are about intermediate between the extremes shown by the others.

Of the six adult females at hand, all have the head markings and dorsal stripe pure white, the latter more or less broken by black streaks and bars, but in every case the nasal tufts are of the distinctive brownish yellow color.

Two juvenal males in the series, one from Admiralty, the other from Etolin Island, have the dorsal stripe distinctly barred.

The most obvious difference between *sitkensis* and *harrisi* is the much paler color of the lower parts in the former. The Sitkan woodpeckers differ somewhat among themselves in this regard, but even those in which the smoky suffusion is most intense, and the coloration darkest, are of a distinctly different hue from *harrisi*. In *sitkensis* the lower parts are of a pinkish, or buffy cast, while in *harrisi* they are slaty or smoky gray.

Some specimens of *harrisi* shot in May and June, in worn and faded plumage, approach in the color of the ventral surface

examples of *sitkensis* taken in the early fall, in freshly acquired winter plumage, but even in these the color is not quite the same, and taking comparable specimens, there is no difficulty in distinguishing the two forms (judging from the material at hand), by this one character alone.

The white-spotted wing coverts of the Sitka woodpecker have been remarked upon by Jenkins (1906, p. 168) and Grinnell (1909, p. 216) as being peculiar to this northern form, as distinguished from typical *harrisi* of the Puget Sound region, but I do not find that this is the case, for in the series at hand from Vancouver Island (eighteen specimens) these spots are almost invariably present in some degree, nearly to the extent shown in the Sitkan birds. This is a character that seems to vary independently of the otherwise general darkening of the species in the humid northwest. Thus the Alaskan subspecies is a relatively paler-colored race with fairly conspicuously white-spotted wing coverts, the Puget Sound *harrisi* (as represented by Vancouver Island specimens) is very much darker colored, with the wing coverts somewhat less conspicuously marked, while the white-bellied form found in California has the wing coverts uniformly black.

Measurements in Millimeters of *Dryobates villosus sitkensis*

No.	Sex	Locality	Wing	Tail	Culmen	Tarsus
9736	♂	Dall Island	127	80	.....	20.5
9739	♂	Etolin Island	121	73	31.2	20.2
10648	♂	Chichagof Island	124	77	33.5	21
9319	♂	Admiralty Island	126	76	31	22.2
462	♂	Admiralty Island	129	60	32	23
1246[1]	♂	Baranof Island	126	82	32.5	23
Average			125.5	74.6	32.04	21.6
9735	♀	Prince of Wales Island	122	79	27.2	22
9741	♀	Wrangel Island	123	82	27.5	22.5
463	♀	Admiralty Island	124	81	28	20
9738	♀	Boca de Quadra	123.5	74	30	21.8
9737	♀	Boca de Quadra	122.2	79.2	28	22
Average			122.94	79.04	28.14	21.66

[1] Coll. of J. Grinnell.

Transmitted September 5, 1911.

LITERATURE CITED

Grinnell, J.

1909. Birds and mammals of the 1907 Alexander expedition to southeastern Alaska. The birds. Univ. Calif. Publ. Zool., **5**, 181–244.

Jenkins, H. O.

1906. Variation in the hairy woodpecker (*Dryobates villosus* and subspecies). Auk, **23**, 161–171, 1 fig. (map) in text.

Oberholser, H. C.

1911. A revision of the forms of the hairy woodpecker (*Dryobates villosus* [Linnaeus]). Proc. U. S. Nat. Mus., **40**, 595–621, pl. 70 (map).

Swarth, H. S.

1911. Birds and mammals of the 1909 Alexander Alaska expedition. Univ. Calif. Publ. Zool., **7**, 9–172, pls. 1–6, 3 figs. in text.

5. (XII) New Copepod Fauna from the San Diego Region, by Calvin Olin Esterly. Pp. 53-92, plates 9-14. December, 1906..... .35
6. (XII) Dinoflagellata of the San Diego Region, II. On Triposolenia, a New Genus of the Dinophysidae, by Charles Atwood Kofoid. Pp. 93-116, plates 15-17.
7. A Discussion of the Species Characters in Triposolenia. I. The Nature of Species Characters. II. The Adaptive Significance of Species Characters. III. The Coincident Distribution of Related Species. By Charles Atwood Kofoid. Pp. 117-126.
8. On the Significance of the Asymmetry in Triposolenia, by Charles Atwood Kofoid. Pp. 127-133.
   Nos. 6, 7, and 8 in one cover. December, 1906..... .35
9. (XIV) Ostracoda of the San Diego Region. II. Littoral Forms, by Chancey Juday. Pp. 135-156, plates 18-20.
10. (XV) Cladocera of the San Diego Region, by Chancey Juday. Pp. 157-158, 1 text figure.
    Nos. 9 and 10 in one cover. January, 1907..... .25
11. (XVI) The Marine Fishes of Southern California, by Edwin Chapin Starks and Earl Leonard Morris. Pp. 159-251, plate 21. March, 1907. .75
12. Biological Studies on Corymorpha. II. The Development of *C. palma* from the Egg. By Harry Beal Torrey. Pp. 253-298, 33 text figures. June, 1907 ..... .50
13. (XVII) Dinoflagellata of the San Diego Region. III. Descriptions of New Species. By Charles Atwood Kofoid. Pp. 299-340, plates 22-23. April, 1907 ..... .50
14. The Structure and Movements of *Condylostoma patens*, by John F. Bovard. Pp. 343-368, 21 text figures. September, 1907..... .25
    Index, pp. 369-383.

Vol. 4. 1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907..... .50
2. (XVIII) Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.
   Nos. 6 and 7 in one cover. April, 1908..... .50
   Index, pp. 395-400.

Vol. 5. 1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909..... .05
6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.
7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
   Nos. 6 and 7 in one cover. February, 1910..... .20
8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.
9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.
10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
    Nos. 8, 9, and 10 in one cover. February, 1910..... .15
11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.
12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
    Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
    Index, pp. 429-440.

---

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma dimorphon* Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Biological Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.

Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

14. (XXXIII) Third Report on the Copepoda of the San Diego Region, by Calvin Olin Esterly. Pp. 313-352; plates 26-32. February, 1911 ..... .40

15. The Genus *Gyrocotyle*, and Its Significance for Problems of Cestode Structure and Phylogeny, by Edna Earl Watson. Pp. 353-468; plates 33-48. June, 1911 ..... 1.00

Vol. 7. 1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10

2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50

3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05

4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15

5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05

6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05

7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. Pp. 205-307. June, 1911 ..... 1.00

8. Description of a New Spotted Towhee from the Great Basin, by J. Grinnell. Pp. 309-311. August, 1911 ..... .05

9. Description of a New Hairy Woodpecker from Southeastern Alaska, by H. S. Swarth. Pp. 313-318. October, 1911 ..... .05

Vol. 8. 1. The Vertical Distribution of *Eucalanus elongatus* in the San Diego Region during 1909, by Calvin O. Esterly. Pp. 1-7. May, 1911 ..... .10

2. New and Rare Fishes from Southern California, by Edwin Chapin Starks and William M. Mann. Pp. 9-19, 2 text-figures. July, 1911 .10

3. Classification and Vertical Distribution of the Chaetognatha of the San Diego Region, Including Descriptions of Some Doubtful Species of the Group, by Ellis L. Michael ..... In press

4. Dinoflagellata of the San Diego Region, IV. The Genus *Gonyaulax*, with Notes on Its Skeletal Morphology and a Discussion of Its Generic and Specific Characters, by Charles Atwood Kofoid. Pp. 187-286, plates 9-17.

5. On the Skeletal Morphology of *Gonyaulax catenata* (Levander), by Charles Atwood Kofoid. Pp. 287-294, plate 18.

6. Dinoflagellata of the San Diego Region, V. On *Spiraulax*, a New Genus of the Peridinida, by Charles Atwood Kofoid. Pp. 295-300, plate 19.

Nos. 4, 5, and 6 in one cover. September, 1911 ..... 1.50

7. Notes on Some Cephalopods in the Collection of the University of California, by S. S. Berry. Pp. 301-310, plates 20-21. September, 1911 .10

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 10, pp. 319-436, pls. 7-12 February 14, 1912

FIELD NOTES ON AMPHIBIANS, REPTILES AND BIRDS OF NORTHERN HUMBOLDT COUNTY, NEVADA

WITH A DISCUSSION OF SOME OF THE FAUNAL FEATURES OF THE REGION

BY

WALTER P. TAYLOR

Smithsonian Institution
FEB 23 1912
National Museum

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ, LEIPZIG.

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology, History.

R. FRIEDLAENDER & SOHN, BERLIN.

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Volume 1, 1902-1905, 317 pages, with 28 plates $3.50

Volume 2 (Contributions from the Laboratory of the Marine Biological Association of San Diego), 1904-1906, xvii + 382 pages, with 19 plates $3.50

Volume 3, 1906-1907, 383 pages, with 23 plates $3.50

A list of titles in volumes 1-3 will be sent on request.

Vol. 4.
1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907..... .50
2. (XVIII)* Behavior of the Starfish *Asterias forreri* de Lorriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907..... 1.00
3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908..... .50
4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30
5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00
6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.
7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.

   Nos. 6 and 7 in one cover. April, 1908..... .50

   Index, pp. 395-400.

Vol. 5. (Contributions from the Museum of Vertebrate Zoology.)
1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00
2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75
3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05
4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05
5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909..... .05

---

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 10, pp. 319-436, plates 7-12 February 14, 1912

FIELD NOTES ON AMPHIBIANS, REPTILES AND BIRDS OF NORTHERN HUMBOLDT COUNTY, NEVADA,

WITH A DISCUSSION OF SOME OF THE FAUNAL FEATURES OF THE REGION

BY

WALTER P. TAYLOR

(Contribution from the Museum of Vertebrate Zoology of the University of California)

CONTENTS

PAGE

Introduction 319
Itinerary 321
Descriptions of Localities 322
The Life Zones of the Pine Forest Mountain Region 333
Discussion of Life Zones 338
Check-lists of Species Recorded by the Nevada Expedition 340
General Observations of the Species 342
The Amphibians 342
The Reptiles 346
The Birds 356
Literature Cited 423
Explanation of Plates 426

INTRODUCTION

In order to progress toward the ultimate solution of the problems in the field of biology, it is essential that increasingly accurate and comprehensive observations of living forms, both in a state of nature and under experimental conditions, be carried

forward and recorded. The biological explorations made in the Pine Forest Mountain region were prosecuted with this principle in mind; and in the present paper detailed facts of possible faunal and distributional significance have been emphasized.

At the present time it is coming to be realized that there are other characters distinguishing species than those brought forward through morphological researches, as, for example, those belonging to the domains of physiology and psychology. These characters, being less accessible and sometimes less tangible, offer more obstacles to precise definition than those others dealing with structure. Nevertheless, traits, habits, manners of performing particular acts, preferences of one kind and another, seem in most cases to be as definite and as constant characteristics of species as the shape and size of bill and feet, or coloration of fur and configuration of skull. An attempt has in this paper been made to place the emphasis upon such non-morphological characters, here mainly psychological. That the facts as recorded are in some cases fragmentary and unrelated to others indicates strongly the general desirability of putting on record such data as are available, to the end that later investigators in this field may at least benefit by that little which is at present known.

This paper represents the completion of the report on the vertebrates of the Pine Forest Mountain region, the first major installment of which appeared as the "Mammals of the Alexander Nevada Expedition of 1909" (Taylor, 1911).

While Mr. Richardson and the writer were carrying on field work in the Pine Forest Mountain region, Miss Alexander and Miss Kellogg were members of a palaeontological expedition working in the same general neighborhood (see Taylor, 1911, p. 205). They incidentally collected specimens of vertebrates and made field notes. The results of their work as well as of our own have been incorporated into the present paper.

The writer must acknowledge indebtedness to the following persons: to Professor Charles A. Kofoid, of the Department of Zoology of the University of California, for generous criticism; to Mr. Joseph Grinnell, Director of the Museum of Vertebrate Zoology of the University of California, for general direction and advice in connection with the paper; to Professor Harvey M.

Hall, of the Department of Botany of the University of California, for identification of plants submitted to him; and to Mr. Harold C. Bryant, Fellow in Zoology on the foundation established by the California Fish and Game Commission, for provisional identification of certain species of reptiles.

ITINERARY

Mr. Charles H. Richardson, Jr., and the writer left Berkeley on May 10, 1909, arriving at Winnemucca, Nevada, on the following morning. From there we journeyed by stage to Quinn River Crossing (Mason's Crossing), seventy-five miles to the northwest. One night en route was spent at Amos (Cane Springs Station), and one at Tregaskis Well. The morning of May 14 found us at our first collecting ground.

Camp was established one mile from the buildings of the Quinn River Ranch on Wheeler Creek, tributary to the river (see map, plate 7). Practically three weeks (May 15 to June 8) were spent at this locality. Twelve miles in a northwesterly direction from Quinn River Crossing is found Big Creek Ranch, the second collecting station. This ranch is located at the base of the Pine Forest Mountains. It constituted the first camp of the "biological cross-section" series (see map, plate 7). By establishing collecting localities from one side of the mountains to the other, 1000 feet apart as regards altitude, we hoped to obtain precise data on the range of species, life zones, and comparative distribution of forms on the two sides of the mountains. Big Creek Ranch was the base camp for all further operations, which had to be conducted by means of pack animals. We remained in this locality two weeks (June 8 to 23).

The next camp was at the head of Big Creek (8000 feet), where the time from June 23 to July 6 was spent. This became the secondary, or mountain base of supplies. The following camps were then established as parts of the cross-section plan: Big Creek (6000 feet), July 6 to 8; Big Creek (7000 feet), July 8 to 10; Duffer Peak Meadow (8400 feet), July 10 to 12; Alder Creek (7000 feet), July 12 to 14; Alder Creek Ranch (5000 feet), July 16 to 18; Head of Big Creek (8000 feet), July 19 to 29. The gaps in the series were thus filled, and the east-west

cross-section completed. It will, of course, have been noted that the cross-section is not an ideal one. To make it so an equal amount of time should have been spent at each locality. Practical difficulties, however, made this impossible. Furthermore, seasonal change, even within the short space of time covered in the cross-section series of camps, affects the distribution of certain forms, particularly birds, and so ideally these localities should all have been worked at the same time.

On July 29 we departed for Leonard Creek, making camp at 6500 feet altitude, and remaining until August 10. On this date we returned to Big Creek Ranch, and prepared our outfit for transit back to the University. Practically three months were occupied in actual collecting.

DESCRIPTIONS OF LOCALITIES

(Refer to map, plate 7)

The following localities were visited either by members of the palaeontological party or by our expedition.

Willow Point, Amos (Cane Springs Station), Sod House Point, and Tregaskis Well (fourteen miles south of Quinn River Crossing) are successive stage stations between Winnemucca and Quinn River Crossing. Chimney Creek is a stream flowing westward out of the Santa Rosa Mountains east of Amos.

Virgin Valley is located northwest of the Pine Forest Mountains over a low range of hills (see map). Thousand Creek flows northeast out of Virgin Valley. It is situated some twelve miles north and a little west of Alder Creek Ranch. Soldier Meadows is located on an arm of the Black Rock Desert, and is forty miles due south of Virgin Valley. Little High Rock Cañon is west and a little south of Soldier Meadows, being just over the Humboldt County line in Washoe County.

Mason's Crossing or *Quinn River Crossing* (altitude 4100 feet).—This locality is situated in the midst of the open desert on the Quinn River. The stream is in this region strongly alkaline and follows a winding course in a general westerly direction, soon turning toward the southwest and flowing into a sink on the Black Rock Desert.

Toward the east appears a series of low, desert hills, which

culminate to the north in Split and Trident peaks. The Pine Forest Mountains, which constitute the highest range in this part of Nevada, are seen to the west. Upon the south appear the Jackson Mountains.

The flat expanse of the open desert extends away in all directions, interrupted in the near vicinity of the Crossing only by two lava buttes which rise up to the northward. One can easily realize that this great extent of regular desert was once the floor of an arm of the great Pleistocene Lake Lahontan.

Tributary to the Quinn River at this locality is Wheeler Creek, which rises in the hills to the northeastward and flows as far as the river for a part of the year. The smaller stream is largely utilized for the irrigation of the Quinn River Ranch, owned by Miller & Lux.

The soil in the vicinity is made up of very fine particles, which fly in clouds in response to the slightest breeze. Ordinarily several miniature sand-pillars or whirls may be seen in the distance. Beneath the surface the soil is exceedingly hard, this fact perhaps accounting for the comparative rarity there of burrowing mammals.

A few willows (*Salix fluviatilis exigua*) along the river were the only trees in the vicinity. Mr. F. M. Payne, of the Miller & Lux Company, said that introduced trees do not thrive.

The commonest shrub on the desert was *Artemisia tridentata*. This plant grew more luxuriantly and to a greater size in the general neighborhood of some creek or stream than elsewhere. On the more arid waste places it was replaced locally by *Artemisia spinescens, Grayia spinosa,* and *Sarcobatus vermiculatus*. On less arid portions of the desert such plants as *Tetradymia spinosa, Chrysothamnus nauseosus*, and *Mentzelia albicaulis* were associated with the true sagebrush (*Artemisia tridentata*).

Along the river, vegetation was very sparse. At intervals there were thickets of willow and wild rose (*Rosa blanda*) but the growth was nowhere luxuriant. Other species occurring along the stream were *Poa buckleyana, Ribes aureum, Radicula sinuata, Vicia americana, Artemisia ludoviciana*, and *Taraxacum officinale*.

A large proportion of the species of animals and plants found

at Quinn River Crossing are typically Sonoran in distribution, many of them being found elsewhere not lower than Upper Sonoran. On the other hand, while a number of the animal species abundant at this locality (e.g., *Oreoscoptes montanus, Dendroica aestiva brewsteri, Eutamias pictus, Perognathus parvus olivaceus, Thamnophis vagrans*) occur also in Transition, no species in other localities characteristic of, or limited to, that zone, with the possible exception of *Otocoris alpestris merrilli* and *Sceloporus graciosus,* were found at Quinn River Crossing. The conclusion seems justified, therefore, that the Quinn River Valley in this vicinity is Upper Sonoran.

Pine Forest Mountains (4350–9400 feet; Biological Cross-section Camps nos. 1 to 8).—If one stands upon a high point and looks out over the lower slopes of the range he is impressed immediately with the excessively arid appearance of the mountains as a whole (see pl. 8, figs. 1 and 2). No trees are to be seen anywhere at the lower altitudes, except for the very narrow and often broken lines along streams. The lower ridges, lying baked and bare, are observed to be unprotected except by a very meager growth of sagebrush or associated xerophytes. In the higher parts of the mountains, the scene is somewhat more varied (see pl. 10, fig. 1). A few quaking-aspen groves are noted on the more humid of the meadows, and brush-like patches of the same species of tree are apparent on certain favorable steep slopes. Furthermore, a tract of limited proportions, confined almost entirely to the western slope of the mountains, is seen to be occupied by small limber pines, *Pinus flexilis* (?) (see pl. 11, fig. 1). It is unfortunate that the identification of the pine is based on foliage only, no cones being at hand. Geographic and zonal considerations indicate that it is *Pinus flexilis,* although its identity can not be considered to be certainly established. Scattering groups of mountain mahogany are observed on certain of the western ridges (see pl. 10, fig. 2).

The topography of the higher parts of the mountains seems to indicate the former presence of glaciers. Several hanging valleys were observed, and in three localities, namely at the head of Leonard Creek, in the vicinity of Alder Creek Lake, and at the head of Big Creek, there are land forms resembling cirques.

Each one of the three little lakes appears to have been formed through the damming up of cañons by morainal material. The best examples of moraines in the mountains are found at the head of Alder Creek. The peculiar shape of Alder Creek Lake (see pl. 10, fig. 2) and the intersection of it by long mounds are with very little doubt to be accounted for in this way. A number of facetted rocks were picked up at Alder Creek Ranch. Certain ridges in the mountains resemble the "sheep-back" type.

There are several extensive meadows, always grass-covered and usually traversed by at least one creek, in the higher parts of the mountains (see pl. 12, fig. 1). Usually there is a limited area of springy ground, surrounded by thickets and grown over with rank grass. Along the creeks or on the borders of the meadow quaking aspens and a few willows may be found. On the mountain slopes rising up from it extensive chinquapin thickets and locally individual limber pines are often noted. Snow banks persist until late in the summer on the highest meadows (see pl. 9, fig. 1), and *Iris missouriensis* and *Veratrum californicum* are common plants on the moister ones (see pl. 11, fig. 2).

Big Creek Ranch (4350 feet; Biological Cross-section Camp no. 1; see pl. 8, fig. 1).—This station is located three-fourths of a mile from the mouth of Big Creek Cañon, and ten or twelve miles in a northwesterly direction from Quinn River Crossing.

The ranch is on a broad alluvial fan. During the summer season all the water of Big Creek is used for purposes of irrigation.

The Pine Forest Mountains rise up immediately to the west, appearing as a series of foothills resembling badlands. Their very sparse covering of xerophilous plants is at once noticeable.

The vegetation of the flat in the neighborhood of the ranch was more scattering even than at Quinn River Crossing, being made up largely of *Chrysothamnus* and *Grayia*, with some *Artemisia tridentata*. About the ranch buildings was a windbreak of poplars. These trees, together with the willows and alders along the stream, were the only ones in the vicinity. The quaking aspens (*Populus tremuloides*) followed the creek down to within a half-mile of the ranch.

As the mountains were approached, a pronounced difference in the fauna, especially as regards reptiles, was observed. The number of species of the latter, as well as the number of individuals, increased markedly. *Cnemidophorus tigris*, *Crotaphytus collaris baileyi*, and *Uta stansburiana* were recorded for the first time. *Crotaphytus wislizenii*, *Sceloporus biseriatus*, and *Phrynosoma platyrhinos* became abundant, whereas previously but few specimens had been collected. Of the mammals, *Neotoma nevadensis*, *Lepus californicus wallawalla*, and *Perodipus microps levipes* were found in somewhat increased numbers. This locality was the only one at which *Onychomys brevicaudus* was secured. As regards birds, Say phoebes, western wood pewees, black-throated sparrows, and western robins were more in evidence.

These facts probably do not indicate difference in temperature so much as they do that there is something present, whether a more suitable dwelling-place or better food supply or something else, which proves especially attractive or favorable to the species in question. For example, the presence of rock piles in which they may nest conveniently accounts, at least partly, for the increase in numbers of wood rats.

One factor which doubtless affects distribution is the nature of the ground (see C. H. Merriam, 1892, p. 46). As Big Creek Ranch is approached the flour-like, hard soil characteristic of Quinn River Crossing is replaced by a more sandy, slightly coarser material. The more favorable conditions in this respect may account somewhat for the difference in number and abundance of certain species of mammals and reptiles at the two localities.

Zonally Big Creek Ranch is inseparable from Quinn River Crossing, except that it apparently possesses a facies representative of a higher division of Upper Sonoran. Nearly all of the species taken at Big Creek Ranch occur elsewhere in Upper Sonoran, and several are not found above that zone.

Transitional elements were, however, noted at Big Creek Ranch, which were lacking at Quinn River Crossing; for example, among plants, *Populus tremuloides*, *Castilleia parvifolia*, *Alnus tenuifolia*, and *Achillaea millefolium lanulosa;* among mammals, *Erethizon epixanthum* and *Microtus mordax;* and among birds

Vireosylva gilva swainsoni. So, keeping in mind the fact that temperature may not be the only or even the principal limiting factor in certain individual cases (of the species cited), still the conclusion is justifiable, that Big Creek Ranch belongs to higher Upper Sonoran than Quinn River Crossing, and may properly be included in the area of admixture of Transition and Sonoran forms, as shown in the accompanying map.

The Big Creek Camps (4500–8000 feet; Biological Cross-section Camps nos. 2 to 4; see pl. 8, fig. 2).—From its mouth to a point about a mile into the mountains Big Creek Cañon is narrow and fairly steep-sided. Then it begins to widen, until at the forks, about two miles distant from the mouth, a broad series of rolling flats comes to view. If the creek is followed still farther, the cañon once more becomes constricted.

In the biographic accounts of certain species reference has been made to the "Dugout Camp," which marks a mining claim. This is located at 5000 feet altitude on Big Creek about halfway between the mouth of the cañon and the forks.

The range in the region of the Dugout Camp and for some distance east and west is made up of steep-sided foothills resembling badlands. This series of hills continues for nearly the entire north and south extent of the Pine Forest Mountains. Then at the forks the rolling flats come into view. These are continuous on the south with the even more extensive Leonard Creek flats. From two to four miles farther west the main ridge of the mountains, culminating in Duffer Peak (9400 feet), is seen.

Biological Cross-section Camp no. 2 (6000 feet; see pl. 8, fig. 2).—This camp was situated on Big Creek about a half-mile above the forks. *Artemisia tridentata* was the prevailing plant all over the flats and ridges. The trees along the stream, named in the order of their abundance, were quaking aspens, willows, and alders. The flowering plant most in evidence in the open was *Lupinus laxiflorus.* This camp may perhaps more properly be said to represent lower Transition than high Upper Sonoran. The green-tailed towhee was common, and *Citellus oregonus* was secured on nearby ridges. The presence of *Chondestes gram-*

macus strigatus indicates, however, that it is at best only low Transition.

Biological Cross-section Camp no. 3 (7000 feet).—This camp was made on a small meadow separated from the main stream of Big Creek by a rocky ledge. The meadow was undoubtedly Transition, as *Thomomys fuscus fisheri* was trapped upon it, and *Iris missouriensis* was fairly common on nearby slopes. *Zonotrichia leucophrys leucophrys* was probably nesting in brush in the vicinity.

Very high Transition, with a touch of Boreal, was represented on a limited area on a north-facing slope on the south side of Big Creek at this altitude. There were several springs in this area, and the verdure grew as luxuriantly as at any locality in the mountains, the thickets being made up of quaking aspens and many water-loving species of plants. In this cool, protected situation both *Hylocichla ustulata swainsoni* and *Zonotrichia leucophrys leucophrys* were noted.

Biological Cross-section Camp no. 4 (8000 feet; see pl. 9, figs. 1 and 2).—This camp at the head of Big Creek, at which more time was spent than at any other established, was located at an altitude of approximately 8000 feet, near the source of the southernmost of the main feeder streams. Geologically speaking, the glade in which camp was situated was apparently a hanging valley.

As might be anticipated, the flowering season was found to be later at this altitude than at the lower camps. Vegetation was comparatively abundant. Quaking aspens grew to a height of thirty feet along the creek. Associated with them in the sheltered cañon was the limber pine, which occurred also quite abundantly on the north-facing slope on the south side of the cañon, and less commonly on the south-facing slope on the opposite side. Such plants as the following, referable to Transition zone and higher, were found at this locality: *Aquilegia truncata, Ribes cereum, Achillaea millefolium lanulosa, Aphyllon fasciculatum, Pentstemon confertus caeruleo-purpureus, Arnica chamissonis, Iris missouriensis, Aconitum columbianum, Elymus pubiflorus, Sisymbrium canescens, Allium validum, Ceanothus velutinus, Castanopsis* (species not known), and *Veratrum californicum*. Of the

plants found the following indicate that zonally the locality is high Transition with a Boreal infusion: *Ribes cereum, Aconitum columbianum, Pinus flexilis, Allium validum, Aquilegia truncata* and *Veratrum californicum. Hylocichla ustulata swainsoni, Zonotrichia leucophrys leucophrys, Microtus mordax, Zapus princeps oregonus*, and *Sorex palustris navigator* also were taken.

Certain warm slopes nearby should probably be regarded as low Transition, for while the Transition species *Prunus demissa* and *Amelanchier alnifolia* were present, so also was the cañon mouse (*Peromyscus crinitus*), an Upper Sonoran form.

Mammals were more numerous at this locality than at any other visited, but birds were rare. In one day during which I remained in camp and kept count of those noted, only sixteen individuals, made up of the following species, were seen: red-shafted flickers, 2; Clarke nutcrackers, 3; Cassin purple finch, green-tailed towhee, thick-billed fox sparrow, rock wren, Audubon warbler, and russet-backed thrush, 1 each; and western robins, 5.

The Duffer Peak Meadow (8400 feet; Biological Cross-section Camp no. 5; see pl. 11, fig. 2).—This station, the highest made by the party, was located on a rather broad, level meadow directly north of Duffer Peak, and in the most extensive belt of limber pines in the mountains. Snowbanks persisted here until late in the summer.

On the north side of the meadow was a tract of quaking aspens. The pine-covered face of the highest peak in the range rose up to the south. The dominant tree of the high pass to the east was the limber pine, associated there with stunted mountain mahogany. To the north, in the direction of Alder Creek Lake, lay one of the principal forested areas, which was interrupted to some extent by slopes of a more open character immediately north of the meadow, covered by chinquapin and quaking aspen. On the west were other meadows.

The Duffer Peak meadow itself was open and grassy, a small lake occupying its lowest portion. *Veratrum californicum* was perhaps the commonest plant on the meadow (see pl. 11, fig. 2).

The pines themselves persisted to the peak, as did also *Eutamias pictus* and *Peromyscus maniculatus sonoriensis.*

Among the species of birds secured at the locality, purple

finches, Audubon warblers, Clarke nutcrackers, white-crowned sparrows, and western red-tails were numbered. The following mammals were noted: *Odocoileus hemionus, Callospermophilus trepidus, Eutamias pictus, Peromyscus maniculatus sonoriensis, Microtus mordax, Zapus princeps oregonus, Canis lestes,* and *Myotis lucifugus longicrus.* The latter was a species of mammal noted at the Duffer Peak meadow only.

The limber pines and the presence of a number of species usually ranging into zones above Transition gave to the locality a distinctly Boreal complexion. As in the case of the head of Big Creek, the predominant Transition facies was somewhat diluted by the addition of certain Boreal elements. It seems appropriate, therefore, to regard the locality as Transition with a marked Boreal infusion.

Alder Creek Camps (5000–7000 feet; Biological Cross-section Camps nos. 6 to 8).—The mountains grade off to the west more gradually, locally at least, than they do to the east. As is the case with certain other desert ranges, as well as with the Warner, Sierra Nevada and other mountains of California, there is a line of faulting along the eastern side, which accounts for the greater steepness upon that slope.

The western slopes seem more rocky and are apparently made of harder material, as the cañon-sides are steeper. There are great masses of igneous rock. In the vicinity of Alder Creek Ranch especially, much scattered pumice stone was noted.

While in general the flora as regards species was the same as on the eastern side, it was noticeably more sparse, and the ridges and flats of the western slope had even more of an arid and baked appearance than those of the eastern.

Biological Cross-section Camp no. 6 (7000 feet).—In favorable situations along the stream, for the most part above this altitude, quaking aspens formed rather dense groves. As a rule, north-facing slopes, i.e., on the south side of the cañon, were covered with a scattering, sometimes with a dense, growth of these trees. Clumps of willows occurred along the stream, and on the arid, exposed ridges mountain mahoganies were fairly common.

The vicinity of Camp no. 6 must apparently be referred to

high Transition. A few limber pines occurred below the level of Alder Creek Lake (7800 feet), and occasionally the penetrating cries of *Nucifraga columbiana* sounded from the ridges. About the lake itself a number of Boreal and Transition forms, as *Aphyllon fasciculatum, Pentstemon confertus caeruleo-purpureus, Arnica chamissonis,* and *Pinus flexilis,* were present. White-crowned sparrows, olive-backed thrushes, Brewer sparrows, chipping sparrows and green-tailed towhees were common at Camp no. 6, as were also Oregon ground squirrels.

Biological Cross-section Camp no. 7 (6000 feet; see pl. 12, fig. 2).—As progress was made down the creek the flora grew more limited. In the neighborhood of this camp there was no thick vegetation away from the stream. That along the creek was made up of quaking aspens and willows, with occasional thick tangles of *Rosa* and other vines. Alders appeared for the first time on this stream not far below this altitude, and were found scatteringly down to Alder Creek Ranch.

Three species of mammals were taken here which make the locality an extremely interesting one from a zonal standpoint, namely, *Neotoma cinerea occidentalis, Zapus princeps oregonus,* and *Putorius cicognani.* The olive-backed thrush, western warbling vireo, and green-tailed towhee were also noted. The exposed ridges in the vicinity may be high Upper Sonoran, as *Sylvilagus nuttalli grangeri* was secured on one of them. On the other hand the Oregon ground squirrel ranges down below the large Alder Creek Meadow (6700 feet) even on exposed ridges. So, if the ridges are Sonoran at all they should be regarded as high Upper Sonoran. There is little doubt that along the stream Transition extends down to and beyond this point. This remarkable association of Boreal, Transition and Upper Sonoran forms, found at several points in the mountains, is strikingly illustrated by the fauna of this locality.

Biological Cross-section Camp no. 8 (5000 feet).—Willows, with a few alders and aspens, made up most of the line of vegetation along the creek in the vicinity of Alder Creek Ranch. Treeless stretches were fairly common. The *Artemisia* association of the open desert was more sparse and scattering here than at any other point visited.

One fact of distribution may be of particular interest, namely, the occurrence on Alder Creek not far above the ranch of a *Populus*, tentatively identified by Professor H. M. Hall of the University of California as *P. balsamifera*. The species was represented by a clump of four trees only. The tree is northern in distribution, the nearest locality from which it is reported by Sudworth (1908, p. 244) being northern Oregon and Idaho. May not a colony of these trees have been left here when the cooler environment of the Glacial period retreated?

Zonally Alder Creek Ranch (Camp no. 8) is referable to Upper Sonoran. *Ammospermophilus leucurus, Neotoma nevadensis, Phrynosoma platyrhinos, Tyrannus verticalis,* and *Icterus bullocki* were all recorded here. That it is high Upper Sonoran is shown by the fact that the green-tailed towhee occurs in the neighborhood. The apparent absence from Alder Creek Ranch of *Citellus mollis*, so abundant on the other side of the mountain, and the scarcity on the Alder Creek side of *Centrocercus urophasianus*, common on the Big Creek side, and so very numerous on the Leonard Creek flats, attracted our attention. Possibly these facts are accounted for, the first on the theory that Alder Creek Ranch is higher in Upper Sonoran zone than is the Quinn River Crossing district, and the second on the observed fact that the sage-brush was very much more sparse on the Alder Creek slopes than on Big or Leonard creeks.

Leonard Creek (6000 feet).—The flats and mesas drained by Leonard Creek are by far the most extensive in the mountains. The main ridge rises up to the west of the Leonard Creek basin, furnishing several tributary streams, while toward the east appear the Pine Forest foothills culminating in Sentinel Peak (6800 feet), and presenting a very arid and barren appearance indeed.

Except where interrupted by patches of dry meadow the flats were covered with sagebrush, which was locally very luxuriant. These dry meadows were apparently slightly more favorably situated as regards moisture conditions than the rest of the flats; the most conspicuous members of their flora were grasses and *Iris missouriensis*.

Willows were the dominant trees along the stream. A few

alders were observed near the Leonard Creek Ranch. A short distance above our camp, which was located at 6500 feet altitude, patches of chinquapin were in evidence, and on certain nearby ridges, at altitudes not much greater than that at which our camp was located, mountain mahogany trees were found.

It is rather difficult to decide whether the Leonard Creek flats should be regarded as Transition or Upper Sonoran. Elements of both were present. *Neotoma cinerea occidentalis* was taken in a rocky outcrop at 6500 feet altitude. *Perognathus parvus olivaceus* was quite common, and *Microtus mordax, Odocoileus hemionus,* and *Citellus oregonus* were recorded. On the other hand, *Reithrodontomys megalotis deserti* was fairly abundant and cottontails and jackrabbits ranged commonly over the flats. Among bird species noted, *Spizella breweri, Oreoscoptes montanus,* and *Centrocercus urophasianus* were present in greatest numbers. White-crowned sparrows, green-tailed towhees, sage sparrows, and vesper sparrows were all noted. One difficulty is apparent in attempting to use species of birds as zone indicators at this time of year (August 1 to 8), namely that many species were no longer nesting and were migrating locally. This probably accounts for the presence at this locality of the white-crowned and sage sparrows, both of which were in all likelihood out of their breeding zone.

It may be said that in all probability the Leonard Creek flats (altitude 6000 to 7000 feet) should be regarded as an area of overlapping Transition and Upper Sonoran, with the emphasis placed on the Transition. This zone certainly follows the stream down nearly to Leonard Creek Ranch. The assemblage of forms more typically Upper Sonoran at the ranch itself is sufficiently predominant to warrant its reference to that zone.

THE LIFE ZONES OF THE PINE FOREST MOUNTAIN REGION

(See map, plate 7)

The region here considered is doubtless fairly typical of the Great Basin in northern Nevada, so that general conclusions as regards life zones, with due regard for local modifying factors, may be widely applicable to the northern Great Basin region.

The following species were doubtless breeding at Quinn River Crossing and Big Creek Ranch. In many cases proof of sexual activity was obtained. The chief evidence from this list would indicate that these localities are both Upper Sonoran.

Species Probably Breeding at Quinn River Crossing or Big Creek Ranch, and Known to Breed in Upper Sonoran Elsewhere

(ranging above in some cases)

Birds

Tyrannus tyrannus
Aphelocoma woodhousei
Molothrus ater artemisiae
Xanthocephalus xanthocephalus
Agelaius phoeniceus (subsp. indet.)
Pœcetes gramineus confinis
Passerculus sandwichensis nevadensis
Chondestes grammacus strigatus
Spizella breweri
Amphispiza nevadensis nevadensis
Melospiza melodia montana
Pipilo maculatus curtatus
Passerina amoena
Vireosylva gilva swainsoni
Dendroica aestiva brewsteri
Geothlypis trichas occidentalis
Icteria virens longicauda
Oreoscoptes montanus
Psaltriparus plumbeus

Mammals

Citellus mollis
Eutamias pictus
Onychomys brevicaudus
Peromyscus crinitus
Neotoma nevadensis
Thomomys nevadensis
Dipodomys merriami nevadensis
Perognathus parvus olivaceus
Perognathus nevadensis
Sylvilagus nuttalli grangeri
Lepus californicus wallawalla
Taxidea taxus

Reptiles

Crotaphytus collaris baileyi

The following species are known to breed commonly in Lower Sonoran elsewhere, and occurred at the lower stations visited by the expedition. Definite proof of the breeding of some of them was obtained.

Species Known to Breed in Lower Sonoran Elsewhere and Probably Breeding in Northern Nevada

Birds

Tyrannus verticalis
Icterus bullocki
Carpodacus mexicanus frontalis
Amphispiza bilineata desertícola

Mammals

Ammospermophilus leucurus
Reithrodontomys megalotis deserti
Antrozous pallidus pallidus

Reptiles

Uta stansburiana
Sceloporus biseriatus
Crotaphytus wislizenii
Phrynosoma platyrhinos
Cnemidophorus tigris

Species Apparently Not Ranging Above Upper Sonoran in the Northern Nevada Region

Birds

Carpodacus mexicanus frontalis
Chondestes grammacus strigatus
Amphispiza bilineata deserticola
Amphispiza nevadensis nevadensis

Mammals

Citellus mollis
Ammospermophilus leucurus
Onychomys brevicaudus
Peromyscus crinitus (possibly ranging into lower Transition)
Reithrodontomys megalotis deserti (possibly ranging into lower Transition)
Neotoma nevadensis
Thomomys nevadensis
Perodipus microps levipes
Dipodomys merriami nevadensis
Perognathus nevadensis
Sylvilagus nuttalli grangeri
Lepus californicus wallawalla (perhaps ranging into lower Transition)
Antrozous pallidus pallidus

Reptiles

Crotaphytus collaris baileyi
Crotaphytus wislizenii
Uta stansburiana
Sceloporus biseriatus
Phrynosoma platyrhinos
Cnemidophorus tigris
Bascanion taeniatum
Pituophis catenifer deserticola
Crotalus, species uncertain

The following species were present and were probably breeding in the mountains (Transition). In certain cases definite proof of sexual activity was obtained.

Species Known to Breed Elsewhere in Transition or Above

Birds

Oreortyx picta plumifera
Selasphorus platycercus
Empidonax wrighti
Carpodacus cassini
Spinus pinus
Zonotrichia leucophrys leucophrys
Junco hyemalis thurberi
Passerella iliaca schistacea
Oreospiza chlorura
Tachycineta thalassina lepida
Vermivora celata orestera
Dendroica auduboni auduboni
Oporornis tolmiei
Cinclus mexicanus unicolor
Penthestes gambeli gambeli
Hylocichla ustulata swainsoni
Sialia currucoides

Mammals

Odocoileus hemionus
Citellus oregonus
Callospermophilus (various species)
Microtus mordax
Microtus (Lagurus) (various species)
Zapus princeps oregonus
Erethizon epixanthum
Putorius cicognani
Putorius arizonensis (possibly breeds below Transition)
Sorex palustris navigator
Myotis lucifugus longicrus

Reptiles

Sceloporus graciosus

Species Apparently Breeding both in Upper Sonoran and Transition in the Northern Nevada Region

Birds

Zenaidura macroura carolinensis
Myiochanes richardsoni richardsoni
Spizella passerina arizonae
Spizella breweri
Melospiza melodia montana
Pipilo maculatus curtatus (occurred only in area of zonal overlapping)
Passerina amoena
Dendroica aestiva brewsteri
Oreoscoptes montanus
Planesticus migratorius propinquus

Mammals

Eutamias pictus
Peromyscus maniculatus sonoriensis
Perognathus parvus olivaceus
Erethizon epixanthum
Canis lestes

Reptiles

Sceloporus graciosus
Thamnophis vagrans

Species Apparently Limited to Pure Transition in the Northern Nevada Region

Birds

Oreortyx picta plumifera
Selasphorus platycercus
Oreospiza chlorura (possibly ranging into Upper Sonoran)
Cinclus mexicanus unicolor

Mammals

Citellus oregonus
Microtus intermedius

Nearly all the forms following proved to be breeding in the Pine Forest Mountains.

Species Known to Breed Elsewhere in Canadian

Birds

Carpodacus cassini
Spinus pinus
Zonotrichia leucophrys leucophrys
Junco hyemalis thurberi
Passerella iliaca schistacea
Vermivora celata orestera
Dendroica auduboni auduboni
Oporornis tolmiei
Penthestes gambeli gambeli
Hylocichla ustulata swainsoni
Planesticus migratorius propinquus
Sialia currucoides

Mammals

Odocoileus hemionus
Marmota flaviventer
Callospermophilus (various species)
Peromyscus maniculatus sonoriensis
Microtus mordax
Erethizon epixanthum
Canis lestes
Putorius cicognani
Putorius arizonensis
Sorex palustris navigator
Myotis lucifugus longicrus

Species in Other Regions Apparently Most Common in Canadian or Above During the Period of Reproduction

(Found locally in the Transition of the Pine Forest Mountains)

Birds

Nucifraga columbiana
Spinus pinus
Zonotrichia leucophrys leucophrys
Hylocichla ustulata swainsoni

Mammals

Marmota flaviventer
Microtus mordax (in some regions occurs in Transition also)
Putorius cicognani
Putorius arizonensis (may be more common in Transition)
Sorex palustris navigator

The following birds occur commonly during the breeding season above Canadian, and breed in the Pine Forest Mountains.

Species Known to Breed in Hudsonian in Other Regions

Hylocichla ustulata swainsoni
Nucifraga columbiana
Zonotrichia leucophrys leucophrys

The small collection of plants leads to much the same conclusions that the faunal lists indicate. Only those species are here listed which have been used by other authors as life zone indicators.

Plants Occurring Elsewhere in Upper Sonoran and Found at Quinn River Crossing and Big Creek Ranch (Upper Sonoran)

Artemisia tridentata
Artemisia spinescens
Sarcobatus vermiculatus
Tetradymia spinosa
Grayia spinosa

Plants Occurring Elsewhere in Transition and Found at Quinn River Crossing and Big Creek Ranch (Upper Sonoran)

Poa buckleyana
Vicia americana
Chrysothamnus viscidiflorus tortifolius
Populus tremuloides (mouth of cañon)
Castilleia parvifolia (foothills)
Artemisia tridentata
Alnus tenuifolia (along stream at Big Creek Ranch)
Achillaea millefolium lanulosa (along stream at Big Creek Ranch)

Plants Occurring Elsewhere in the Sonoran Zones and Found in the Pine Forest Mountains

Cercocarpus ledifolius (found on certain ridges from 7000 to 8800 feet)
Artemisia tridentata (found from 4100 to 9400 feet altitude)

Plants Ordinarily Occurring in Transition and Found in the Pine Forest Mountains

(Cool, shaded situations in meadows or along streams, except as noted, from 7500 to 8600 feet altitude)

Prunus demissa (found on favorably exposed slopes at 8000 feet)
Aquilegia truncata
Ribes cereum (ordinarily occurring elsewhere in upper Transition and above)
Achillaea millefolium lanulosa
Aphyllon fasciculatum
Pentstemon confertus caeruleo-purpureus
Cercocarpus ledifolius (on dry, exposed ridges 7000 to 8800 feet)
Iris missouriensis (in meadows and on dry, open hillsides)
Amelanchier alnifolia (found on favorably exposed slopes at 8000 feet)
Arnica chamissonis
Aconitum columbianum
Sisymbrium canescens
Hypericum formosum
Artemisia tridentata (found from 4100 to 9400 feet altitude)
Ceanothus velutinus (on favorable slopes)
Veratrum californicum (ordinarily occurring elsewhere in upper Transition and above)

Plants Ordinarily Occurring in Canadian or Hudsonian and Found in the Pine Forest Mountains

(8000 feet and above)

Aquilegia truncata
Ribes cereum
Arnica chamissonis
Iris missouriensis (from 7000 feet up)
Aconitum columbianum
Sisymbrium canescens
Pinus flexilis
Allium validum
Ceanothus velutinus
Veratrum californicum (in meadows 7000 feet in altitude and above)

DISCUSSION OF LIFE ZONES

The life zones represented in the region are Upper Sonoran and Transition, with a touch of Boreal (see map, pl. 7).

The desert proper, comprising in this region the broad flats of the Quinn River Valley and the neighboring deserts, is Upper Sonoran. On favorable slopes tongues of this zone invade the mountains to an altitude of 8000 feet at least, as is indicated by the presence at that elevation of *Reithrodontomys megalotis deserti* and *Peromyscus crinitus*.

The zone of widest extent in the mountains is the Transition. The most conspicuous element of its flora on exposed flats and treeless ridges was *Artemisia tridentata*. The most abundant

Transition tree was *Populus tremuloides*. The occurrence of this species and of *Alnus tenuifolia* along creeks to 4500 feet altitude, and even in the case of *Alnus* below that, indicates the downward extension of Transition. Certain species of mammals, ordinarily characteristic of that zone, were found at comparatively low altitudes. *Callospermophilus trepidus* and *Microtus mordax* were both found near Big Creek Ranch, the former on a nearby foothill ridge at 5000 feet, and the latter along the creek at the ranch proper. *Neotoma cinerea occidentalis* was secured at 6500 feet altitude on both Alder and Leonard creeks, and *Zapus princeps oregonus* at 6000 feet on Alder Creek.

In an earlier paper (Taylor, 1911, p. 226 and elsewhere in the same paper) the presence of a zone above Transition was rather questioned. A careful analysis of the vertebrate fauna and of the flora leaves no doubt that while there is locally present a Boreal assemblage of forms, still there is no definite tract of pure Boreal. The species which are found elsewhere above Transition and which are present in the Pine Forest Mountains cannot be referred as a whole to either the Canadian or the Hudsonian subdivision of the Boreal, as an inspection of the foregoing lists will show. Such species have been grouped together, and where they occur there is said to be a *Boreal infusion*. These areas are very limited in extent. In general the pine-covered areas, together with certain shaded cool strips along the streams in the higher parts of the mountains, may be regarded as tracts of such Boreal infusion into a predominating Transition assemblage of species.

The small extent of the Pine Forest Mountains and their comparative lack of elevation above the level of the plateau (see C. H. Merriam, 1890, p. 27) are obstacles to the plotting of their life zones. These factors decrease their humidity and give this element, as compared with temperature, a disproportionate influence in determining the presence of particular species, and the absence of others (see C. H. Merriam, 1890, p. 26, footnote). This being the case, the life-zone concept here becomes difficult of application, since boundaries of zones cannot be drawn with the precision possible in many other regions.

CHECK-LISTS OF SPECIES RECORDED BY THE NEVADA EXPEDITION

For list of mammals see Taylor (1911, p. 208).

Amphibians

PAGE
1. Hyla regilla Baird and Girard 342
2. Bufo boreas Baird and Girard 343
3. Bufo lentiginosus woodhousei Girard 344
4. Scaphiopus hammondi Baird 345

Reptiles

1. Crotaphytus collaris baileyi Stejneger 346
2. Crotaphytus wislizenii Baird and Girard 346
3. Uta stansburiana Baird and Girard 348
4. Sceloporus graciosus Baird and Girard 349
5. Sceloporus biseriatus Hallowell 350
6. Phrynosoma platyrhinos Girard 351
7. Cnemidophorus tigris Baird and Girard 352
8. Bascanion taeniatum (Hallowell) 353
9. Pituophis catenifer deserticola Stejneger 354
10. Thamnophis vagrans (Baird and Girard) 354
11. Crotalus (species indet.) 355

Birds

1. Larus delawarensis Ord. 356
2. Hydrochelidon nigra surinamensis (Gmelin) 356
3. Anas platyrhynchos Linnaeus 357
4. Nettion carolinense (Gmelin) 357
5. Querquedula cyanoptera (Vieillot) 357
6. Dafila acuta (Linnaeus) 357
7. Nycticorax nycticorax naevius (Boddaert) 357
8. Porzana carolina (Linnaeus) 358
9. Fulica americana Gmelin 358
10. Thamnophis vagrans (Baird and Girard) 354
11. Steganopus tricolor Vieillot 359
12. Recurvirostra americana Gmelin 360
13. Actitis macularius (Linnaeus) 360
14. Oxyechus vociferus (Linnaeus) 361
15. Oreortyx picta plumifera (Gould) 361
16. Centrocercus urophasianus (Bonaparte) 362
17. Zenaidura macroura carolinensis (Linnaeus) 363
18. Cathartes aura septentrionalis Wied 364
19. Circus hudsonius (Linnaeus) 364
20. Accipiter velox (Wilson) 364
21. Buteo borealis calurus Cassin 364
22. Aquila chrysaëtos (Linnaeus) 365

PAGE
23. Falco mexicanus Schlegel 365
24. Falco sparverius phalaena (Lesson) 366
25. Asio wilsonianus (Lesson) 366
26. Bubo virginianus pallescens Stone(?) 366
27. Speotyto cunicularia hypogaea (Bonaparte) 367
28. Ceryle alcyon (Linnaeus) 367
29. Colaptes cafer collaris Vigors 367
30. Phalaenoptilus nuttalli nuttalli (Audubon) 369
31. Chordeiles virginianus hesperis Grinnell 369
32. Aëronautes melanoleucus (Baird) 370
33. Selasphorus platycercus (Swainson) 370
34. Selasphorus rufus (Gmelin) (?) 371
35. Tyrannus tyrannus (Linnaeus) 371
36. Tyrannus verticalis Say 372
37. Sayornis sayus (Bonaparte) 373
38. Nuttallornis borealis (Swainson) 373
39. Myiochanes richardsoni richardsoni (Swainson) 373
40. Empidonax trailli trailli (Audubon) 374
41. Empidonax hammondi (Xantus) 374
42. Empidonax wrighti Baird 374
43. Otocoris alpestris merrilli Dwight 376
44. Pica pica hudsonia (Sabine) 377
45. Aphelocoma woodhousei (Baird) 378
46. Corvus corax sinuatus Wagler 378
47. Nucifraga columbiana (Wilson) 379
48. Dolichonyx oryzivorus (Linnaeus) 380
49. Molothrus ater artemisiae Grinnell 380
50. Xanthocephalus xanthocephalus (Bonaparte) 381
51. Agelaius phoeniceus (subspecies indet.) 382
52. Sturnella neglecta Audubon 384
53. Icterus bullocki (Swainson) 385
54. Euphagus cyanocephalus (Wagler) 386
55. Carpodacus cassini Baird 387
56. Carpodacus mexicanus frontalis (Say) 388
57. Astragalinus psaltria hesperophilus Oberholser 389
58. Spinus pinus (Wilson) 389
59. Poœcetes gramineus confinis Baird 389
60. Passerculus sandwichensis alaudinus Bonaparte 390
61. Passerculus sandwichensis nevadensis Grinnell 390
62. Chondestes grammacus strigatus Swainson 391
63. Zonotrichia leucophrys leucophrys (J. R. Forster) 392
64. Spizella passerina arizonae Coues 393
65. Spizella breweri Cassin 393
66. Junco oreganus thurberi Anthony 395
67. Amphispiza bilineata deserticola Ridgway 396
68. Amphispiza nevadensis nevadensis (Ridgway) 397
69. Melospiza melodia montana Henshaw 399
70. Passerella iliaca schistacea Baird 400

PAGE
71. Pipilo maculatus curtatus Grinnell 401
72. Oreospiza chlorura (Audubon) 402
73. Zamelodia melanocephala (Swainson) 403
74. Passerina amoena (Say) 404
75. Passer domesticus (Linnaeus) 405
76. Piranga ludoviciana (Wilson) 405
77. Petrochelidon lunifrons lunifrons (Say) 405
78. Hirundo erythrogastra Boddaert 406
79. Iridoprocne bicolor (Vieillot) 407
80. Tachycineta thalassina lepida Mearns 407
81. Stelgidopteryx serripennis (Audubon) 407
82. Lanius ludovicianus excubitorides Swainson 407
83. Vireosylva gilva swainsoni (Baird) 408
84. Vermivora celata orestera Oberholser 409
85. Dendroica aestiva brewsteri Grinnell 409
86. Dendroica coronata hooveri McGregor 411
87. Dendroica auduboni auduboni (J. K. Townsend) 411
88. Oporornis tolmiei (J. K. Townsend) 412
89. Geothlypis trichas occidentalis Brewster 412
90. Icteria virens longicauda Lawrence 413
91. Wilsonia pusilla pileolata (Pallas) 413
92. Cinclus mexicanus unicolor Bonaparte 413
93. Oreoscoptes montanus (J. K. Townsend) 413
94. Salpinctes obsoletus obsoletus (Say) 416
95. Troglodytes aëdon parkmani Audubon 417
96. Telmatodytes palustris plesius (Oberholser) 417
97. Sitta canadensis Linnaeus 418
98. Penthestes gambeli gambeli (Ridgway) 418
99. Psaltriparus plumbeus (Baird) 419
100. Regulus calendula calendula (Linnaeus) 419
101. Hylocichla ustulata swainsoni (Tschudi) 420
102. Planesticus migratorius propinquus (Ridgway) 420
103. Sialia currucoides (Bechstein) 421

GENERAL OBSERVATIONS ON THE SPECIES

THE AMPHIBIANS

Hyla regilla Baird and Girard

Pacific Tree Frog

Distribution.—A number of specimens of this remarkable little tree frog (see Test, 1899, p. 477) were secured in the mountains. With the exception of one, which was found at an altitude of 6000 feet on Alder Creek, our series of six individuals was

taken either in or near a small lake (altitude 8400 feet) near Duffer Peak.

The present record is the first known to the writer from northern Nevada. The area in which the Pacific tree frog occurs in greatest numbers is the Pacific Slope west of the Sierra Nevada (Test, 1899, p. 480). The Government Death Valley Expedition (Stejneger, 1893, p. 222) recorded it in some numbers from southern Nevada, and Test (1899, p. 490) in listing the specimens in the National Museum mentions one example from Ogden, Utah. This author comments on the distribution of the species and calls attention to the fact that it is semi-isolated in the southern Great Basin mountain ranges; and further, that the manner of its spreading from place to place has not been explained satisfactorily. He suggests (p. 481) that the present distribution of *Hyla regilla* may be accounted for through the great inland lakes formerly existing in Panamint and Death valleys, the species following the borders of the lakes and up the streams flowing into them, and being left stranded where now found. A similar suggestion may be offered for the presence of the tree frog on the semi-isolated Pine Forest Mountains. The waters of the irregular and extensive Pleistocene Lake Lahontan bathed the lowermost slopes both of the Pine Forest Mountains and of the Sierra Nevada, thus furnishing a continuous water-front across all the territory intermediate between portions of the range of *Hyla regilla* which are now discontinuous (namely, the Sierra Nevada and Pine Forest Mountains).

Habits.—The individual taken on Alder Creek was caught in a mouse trap set ten feet from the stream. Although they probably never get very far from water, they evidently wander about to a certain extent. Tadpoles and young tree frogs in various stages of development were noted July 31 in the lake on Duffer Peak Meadow.

Bufo boreas Baird and Girard

Mountain Toad

Distribution.—The twelve examples of the mountain toad secured were all taken in the higher parts of the mountains as follows: Duffer Peak Meadow (8400 feet), 5; head of Alder

Creek (7800 feet), 1; head of Leonard Creek (8500 feet), 4; and head of Big Creek (8000 feet), 2. The species was fairly common in suitable environments at altitudes of 8000 feet or over.

This toad may be found to approach or be referable to *Bufo boreas nelsoni* (Stejneger, 1893, p. 220), the type locality of which is Oasis Valley, Nevada. In the Pine Forest Range the species is completely isolated geographically and so might be expected to exhibit variation from typical *boreas*.

Habits.—These little toads were not infrequently noted on mountain meadows. Two individuals, probably a pair, were found in an iris patch on a meadow at the head of Leonard Creek. Two others were taken in short meadow grass between some rocks at the margin of the same meadow. Near Duffer Peak an individual was secured on the shore of a small lake, and on a nearby meadow one was observed hopping along on the dry ground among some green leafy plants a yard distant from a spring. One was found near a high mountain lake in a steer hoof-print which was filled with water, another being secured in the lake itself.

Bufo lentiginosus woodhousei Girard

Rocky Mountain Toad

Distribution.—Taken at three points touched by the expedition: Quinn River Crossing (4100 feet), 13 specimens; Big Creek Ranch (4350 feet), 9; and Leonard Creek (4300 feet), 1. As would be implied by these figures, *Bufo lentiginosus woodhousei* was the common toad of the flat, but did not range into the mountains even along the streams. A single individual was observed near the stream at Alder Creek Ranch.

I have seen no record of the species from northern Nevada. Dr. C. Hart Merriam has recorded it (in Stejneger, 1893, p. 221) from several localities in the southern part of the state.

Habits.—Toads were numerous along the streams at Big Creek Ranch. Five were caught in one day. One strove to escape by swimming to the bottom of the stream and remaining there quietly for several minutes. As a rule, however, when the toads are pursued, they leave the water and try to escape by rapid

hopping. Upon being captured they often object with monosyllabic croaks, and if held in the hand never fail to emit a quantity of fluid from the cloaca.

In every case in which the toads are killed by the use of chloroform it is found that the poisonous white secretion is exuded from the glands of the skin, and stands out all over the animal in the form of small drops.

Toads were caught in tall grass and soft mud near Wheeler Creek (Quinn River Crossing), in a ditch at Leonard Creek Ranch, and both in and near the stream at Big Creek Ranch. None were seen more than fifteen feet from running water.

On June 9 a pair were observed copulating in the stream at Big Creek. Tadpoles, supposedly of this species, were observed in large numbers at Quinn River Crossing on May 24, and were seen also at Leonard Creek Ranch on August 7.

Scaphiopus hammondi Baird

Western Spadefoot

Distribution.—Three specimens taken, two at Quinn River Crossing (4100 feet), and one at Big Creek Ranch (4350 feet).

The species has previously been recorded from scattered localities in the Great Basin; for example, Olancha and Owens Lake, California; Salt Lake City, Utah; Fort Walla Walla, Washington; and Pyramid Lake, Nevada. Consequently its discovery in the northern part of the state was to be expected.

Habits.—Without doubt the spadefoot would have eluded our utmost vigilance had we not been at work during its breeding season.

The first specimen (no. 1568) was taken on May 30. It was slowly walking and hopping over damp ground near thick swamp grass. On June 4 a second *Scaphiopus* (no. 1567) was secured. Attention was attracted to it by a rustling sound as it moved through a tussock of wild hay in a meadow. The last specimen (no. 1566) was caught June 21 in a mouse trap set in grass beneath willows near a stream at Big Creek Ranch.

A large number of young Salientia which were assumed to belong to this species were collected on June 7 in the shallow water of a marshy meadow at Quinn River Crossing. They were

in various stages of development, and the resemblance of the oldest to *Scaphiopus*, together with the probability that the spadefoot was breeding there and at that time, makes a strong circumstantial case for their being referable to it.

THE REPTILES

Crotaphytus collaris baileyi Stejneger

Bailey Lizard

Distribution.—The eleven specimens of this form were all taken near Big Creek Ranch, at altitudes ranging from 4800 feet to 5400 feet.

The species is reported from a number of localities in Nevada and the northern Great Basin (see Van Denburgh, 1897, p. 56). The present furnishes the first definite record for northern Nevada. The localized range of the species in this locality indicates that its distribution over the Great Basin is discontinuous.

Habits.—We looked in vain for this lizard on the open desert and on certain of the lower slopes of the mountains. All but one were secured on top of a steep-sided, rocky ridge (altitude 5000 feet) near Big Creek Ranch. The exception was collected in Big Creek Cañon just below the Dugout Camp (4800 feet) and at the base of the steep-sided ridge just mentioned.

One was apparently resting in a groove on one of the stones. We saw none on very large boulders. *Crotaphytus c. baileyi* does not seem to be as adept at clinging to rocks in any position as is *Sceloporus biseriatus*. The movements of *Crotaphytus c. baileyi* resemble those of *C. wislizenii*.

Some of the individuals taken were probably paired; at any rate, their being secured close together might so indicate.

The Bailey lizard is a nimble animal, jumping short distances from rock to rock. Frequently individuals allowed of very close approach, remaining perfectly quiet (see Ruthven, 1907, p. 513), but at other times they retreated with great rapidity.

The example taken in Big Creek Cañon was just shedding its epidermis, fragments of the old skin being still adherent.

Crotaphytus wislizenii Baird and Girard

Leopard Lizard

Distribution.—Recorded from the following localities: Amos

(4400 feet), 4; Quinn River Crossing (4100 feet), 10; Big Creek Ranch and vicinity (4350 feet), 31; Alder Creek (5000 feet), 1; Leonard Creek (4700 to 5000 feet), 6; Thousand Creek Flat (5000 feet), 4.

One of the commonest of the reptiles of the desert. As will have been observed, we did not discover it at such great altitudes as are recorded by C. Hart Merriam (in Stejneger, 1893, pp. 167–168). In our experience, *C. wislizenii* does not ordinarily range so high as *Cnemidophorus tigris*, which we found at an altitude of 5000 feet on certain ridges near Big Creek Ranch. On these ridges *wislizenii* was replaced by *baileyi*. This is a seeming deviation from the range relations of the two species of *Crotaphytus* given by Ruthven (1907, p. 518), according to whom the distribution of *Crotaphytus wislizenii* corresponds closely to that of *C. c. baileyi*. Locally in the Pine Forest Mountain region, as has been shown, the ranges of the two did not overlap, *baileyi* being practically limited to a single rocky ridge, and *wislizenii* to the desert flat and a short distance up certain cañons. Ruthven did not find the leopard lizard in Upper Sonoran, whereas all our localities belong to that life zone.

Leopard lizards were found in washes and on lesser ridges of the open desert, under various species of desert plants. As was the case with other species of reptiles, *Crotaphytus wislizenii* was much more common at Big Creek Ranch, that is, along the eastern foothills of the mountains, than at any other locality visited.

Habits.—We found these lizards comparatively easy to noose. When really surprised they exhibit tremendous speed, never stopping until they reach some convenient bush, into the shelter of which they crawl and remain quiet. One individual, on being pursued, escaped by running into a burrow.

One shot in the top of a low thorny bush on the mesa near Quinn River Crossing contained the partly digested remains of a *Sceloporus graciosus*.

When handled the animals make a hissing sound and vigorously attempt to bite. One uttered a low moaning sound. While at rest they keep the head raised from the ground and watch the intruder, but when in motion lower it. One was seen running

into a bush after a cicada, which it apparently failed to secure. Next it crawled slowly along, occasionally protruding its tongue. When a fly buzzed about the bush and alighted on the ground some two and a half feet away it raised its head and started a little as if it recognized the sound. Then it crawled slowly up toward the fly and as the insect left the ground the lizard jumped four inches into the air after it. In executing this leap all four feet necessarily left the ground. Once the lizard crouched down on a gray sage-leaf background with which the color of its body blended perfectly.

Numbers of the females exhibited the red coloration characteristic of some examples during the breeding season. The first specimen showing this character was secured June 8, between Quinn River Crossing and Big Creek Ranch.

Uta stansburiana Baird and Girard

Brown-shouldered Lizard

Distribution.—Collected in greater numbers at Virgin Valley than at any other locality visited. Specimens were secured as follows: Virgin Valley (5000 feet), 12; Big Creek Ranch (4350 to 5000 feet), 10; Alder Creek Ranch (5000 feet), 2; Quinn River Crossing (4100 feet), 1. Seen at Amos (4400 feet).

The type locality of the brown-shouldered lizard is the "Valley of the Great Salt Lake, Utah." It has been recorded from localities north and east of the Pine Forest Mountains, but I can find no record of its occurrence in the Mount Shasta and Warner Mountain regions of California, which lie to the westward. No specimens of *Uta* were obtained by the Warner Mountain Expedition of the Museum of Vertebrate Zoology in 1910. Possibly the species does not range far west of the Pine Forest Mountains.

As is the case with many of our reptiles, *Uta stansburiana* was very much more common along the mountains than on the open desert.

Habits.—*Uta stansburiana* is characteristically a ground-loving species, as noted by Van Denburgh (1897, p. 58), though occasional individuals were noted either on boulders or in rocky

situations. They are active and extremely shy. When once startled *Uta* generally keeps running until it has reached a hiding place, unlike certain other lizards, as *Sceloporus* or *Crotaphytus*, which nearly always stop after running some distance, apparently to see whether or not the intruder is still at hand.

On June 20 a female containing three eggs with heavy shells was secured.

Sceloporus graciosus Baird and Girard

Mountain Lizard

Distribution.—The widespread occurrence of this lizard is best indicated by the following list of localities and specimens: Winnemucca (4300 feet), 1; Virgin Valley (5000 feet), 2; Quinn River Crossing (4100 feet), 23; Alder Creek Cañon (6000 feet), 3; mouth Alder Creek (5000 feet), 1; Big Creek Ranch (4350 feet), 3; Big Creek Cañon (4800 to 6000 feet), 6; Leonard Creek (5000 to 6500 feet), 3. The species was observed also at Amos and at Leonard Creek Ranch.

We found the mountain lizard in Upper Sonoran and Lower Transition zones together with those species of birds and mammals which C. H. Merriam (in Stejneger, 1893, p. 184) mentions as being characteristically associated with it.

The different habitats (in northern Nevada) of the two species of *Sceloporus* taken by us may be understood from the following table:

Sceloporus graciosus	*Sceloporus biseriatus*
1. Typically ground-loving.	1. Typically rock-loving.
2. Numerous on flats of open desert.	2. None found on flats of open desert.
3. None found on rocks of lower slopes of foothills. Rarer as mountains were approached.	3. Found abundantly on rocks of lower slopes of foothills. More numerous as mountains were approached.
4. A few found on the broad arid mountain valleys of Big and Leonard creeks at 6500 feet altitude, so more typically a mountain-dwelling species.	4. Not taken above 5000 feet altitude, so not so typically a mountain-dwelling species.

It should be remarked that while *S. biseriatus* was not taken

on the flats of the open desert, three specimens were secured on a rocky butte north of Quinn River Crossing.

The above table shows *S. graciosus* to possess the wider altitudinal range, *S. biseriatus* being, for the most part, confined to a narrow strip along the lower slopes of the foothills.

At Quinn River Crossing several specimens of *S. graciosus* were taken in mouse traps.

Those stretches of desert seem to be preferred where sagebrush (*Artemisia tridentata*) grows very thickly, although mountain lizards are occasionally to be found on more open sandy washes.

Habits.—They were rather commonly observed climbing about among the branches of the sage. When pursued they often attempted to escape in this way. Ordinarily, when surprised, they moved with great rapidity to the shelter of a bush, on the ground under which they remained motionless, until the collector came into the near vicinity. Then they retreated into the thicker brush or disappeared into some convenient burrow. Although in the open the lizards were very shy, when they were in the shelter of the brush one could approach them closely.

Two females containing eggs were taken at Quinn River Crossing May 21, one at Big Creek Ranch June 18, and another at 4800 feet on Big Creek June 25.

Crotaphytus wislizenii is doubtless one of their chief enemies. One of the leopard lizards taken contained the partly digested remains of a *Sceloporus graciosus*.

Sceloporus biseriatus Hallowell

Rock Lizard

Distribution.—Quite common at Big Creek Ranch, but rare at Quinn River Crossing. To enumerate stations at which specimens were collected: Quinn River Crossing (4100 feet), 3; Virgin Valley (5000 feet), 2; Limestones (near Dike colony, south of Big Creek Ranch), Pine Forest Mountains, 1; Big Creek Ranch (4350 feet), 38.

Van Denburgh (1897, p. 83) calls attention to the fact that

this lizard is common in Idaho, and observes that it probably occurs the whole length of the Great Basin.

The relative abundance of rock lizards at Big Creek Ranch is easily accounted for by the presence of rocky ridges. The buttes at Quinn River Crossing upon which three specimens were captured rise up only slightly above the level of the plain. At Big Creek Ranch a *Sceloporus* of this species was caught in a mouse trap set in one of the ranch buildings. We found rock lizards invading the mountains to a height of a little more than 5000 feet. They apparently do not range so high in northern as in southern Nevada (see Stejneger, 1893, p. 184).

Habits.—The vast majority of the individuals observed were seen on rocks and boulders at an average altitude of about 4600 feet. Rock lizards at times apparently take advantage of rocks upon which excrement of birds is found. The fecal matter attracts flies and gnats which may serve as food to the lizards.

A great many of the specimens captured had lost parts of their tails and presented caudal stubs in various stages of regeneration.

Several females secured June 11 contained developing eggs.

The coloration of these lizards blended remarkably with that of the rocks upon which they were found, and made them exceedingly hard to discern except when they were in motion.

Phrynosoma platyrhinos Girard

Desert Horned Lizard

Distribution.—Most of the specimens taken were secured in the vicinity of Big Creek Ranch, that is, about the foothills of the Pine Forest Mountains, and on the nearby desert. Twenty-five specimens were preserved at this locality. Others were taken as follows: Quinn River Crossing, 3; Leonard Creek, 4; Thousand Creek Basin, 5; Amos, 1; Alder Creek, 1.

As is shown by the large proportion of horned lizards from Big Creek Ranch, the species was more numerous near the foothills than away from them on the open desert. They ranged fairly commonly to 5000 feet altitude, both in the cañon and on ridges of the foothills.

Our records are the first for the northern part of Nevada known to me. Van Denburgh (1897, p. 99) states that *platyrhinos* crosses Nevada and ranges into Utah, and lists a series of localities in the southern part of the state, Pyramid Lake being the most northerly one mentioned. It is said to inhabit Idaho, also, so one would expect to find it in northern Nevada.

Habits.—Sand was adherent to the back of one horned lizard secured, as if it had recently been covered. Another individual was found in a hole with only its head protruding. All appearances lead to the conclusion that the animal had made the hole, or had at least remodeled it, for earth had recently been thrown out and tracks of the horned lizard were seen in the entrance. The animals were found on sandy, on loamy, and on sun-baked hard soil. One horned lizard, upon being picked up, opened its mouth and made a hissing sound.

Of three individuals taken July 3 on Big Creek, two were shedding their epidermis.

A pair of horned lizards were observed copulating on June 10. On June 14 a female containing ten eggs was taken.

Cnemidophorus tigris Baird and Girard

Desert Whip-tailed Lizard

Distribution.—The thirty-six specimens of this lizard in the collection of the expedition came from the vicinity of Big Creek Ranch (4350 feet). We looked in vain for the species on the open desert in the vicinity of Quinn River Crossing. Evidently a strip of land immediately adjoining the foothills is either the only place inhabited by it, or at least is much preferred. It is rather peculiar that whip-tailed lizards were not recorded from Alder Creek Ranch on the west side of the mountains. A number of facts of distribution, of which this is one, show that Alder Creek Ranch differs environmentally to an appreciable degree from Big Creek Ranch.

The latter locality is Upper Sonoran zone (see C. Hart Merriam, in Stejneger, 1893, p. 199), in some respects approaching Lower Transition.

The most northerly part of Nevada from which I have found

this lizard recorded is the vicinity of Reno. It ranges (Van Denburgh, 1897, p. 136) into southern Idaho and western Utah, however, so would be expected to occur generally in the northern part of the Great Basin.

Habits.—The desert whip-tailed lizard was found alike on the sides of dry washes and on the open flat desert in the vicinity of the foothills. It ranged in small numbers to an altitude of 5000 feet on the low ridges, and a short distance up Big Creek Cañon. A single specimen was taken in the vicinity of the forks of Big Creek (5700 feet).

If surprised, *Cnemidophorus* runs with great speed, holding its long tail erect in air something in the manner of *Callisaurus ventralis*. When at ease it progresses more slowly, dragging itself along on its belly and waddling from side to side. This has been described (J. and H. W. Grinnell, 1907, p. 35) as being a peculiar slinking, hesitating gait. They run a short distance very swiftly, then creep along in a jerky fashion, bobbing the head up and down. When at some distance from the intruder they remain motionless, eyeing him.

Sometimes as many as twenty individuals were seen in the course of a morning's hunt.

Their long narrow bodies and extremely agile movements combine to make noosing them (see J. and H. W. Grinnell, 1907, p. 7) almost an impossibility.

They were seen in copulation on June 10, and *pairs* were commonly seen after this date. On June 21 one was seen pursuing another, but whether this was for purposes of play or was an exhibition of sexual instinct is not known.

Bascanion taeniatum (Hallowell)

Striped Racer

Distribution.—Four specimens of this widely distributed form (see Stejneger, 1893, p. 210) secured, localities being as follows: Quinn River Crossing (4100 feet), 2 (taken on the open desert several miles from any mountains); Big Creek (5000 feet), 1; and Leonard Creek (4700 feet), 1.

The species has been recorded from Antelope Springs and

Carson City, Nevada, from Bliss and the Snake River in Idaho, and from Shasta, Inyo, and Kern counties in California. The present are definite records from a point near the center of the range implied by these localities.

Habits.—While these snakes do not move as rapidly as the red racers, they are by no means sluggish.

Both of those captured at Quinn River Crossing attempted to escape by climbing through a large sagebush. When secured they fought vigorously, coiling themselves about the limbs of the bushes and resisting capture to the utmost.

The specimens taken on Big and Leonard creeks were both seen as they were crossing the mountain road. The one on Big Creek, after traveling rapidly off the roadway, observing that it was not pursued, stopped momentarily under a sagebush. On Leonard Creek the racer was taken on a hot dry mesa, a hundred yards or more from the nearest water.

Pituophis catenifer deserticola Stejneger

Desert Gopher Snake

A fragment of a gopher snake was picked up on May 11 near the Western Pacific tracks at Winnemucca. Two perfect specimens were later secured, both in Big Creek Cañon, one at an altitude of 5400 feet, and the other at 6000 feet.

The gopher snake doubtless occurs generally in small numbers over the deserts of northern Nevada and to some extent on the broad flats in the mountains.

The first specimen was taken in sagebrush on the ground not far from the creek near the Dugout Camp, Big Creek Cañon.

Thamnophis vagrans (Baird & Girard)

Wandering Garter Snake

Distribution.—The commonest snake in the region, both on the desert and in the mountains. Specimens were recorded as follows: Quinn River Crossing (4100 feet), 5; Alder Creek Lake (7800 feet), 3; Duffer Peak Meadow (8400 feet), 1; Leonard Creek Ranch (4300 feet), 1; Leonard Creek Flat (6000 feet),

1; Virgin Valley (5000 feet), 1; Thousand Creek Flat (5000 feet), 1.

Habits.—Garter snakes were fairly common in the grassy marshes along the Quinn River. When pursued they moved with a fair degree of rapidity and generally took refuge in the water of some irrigating ditch, or in a pool of the main river itself. Upon being roughly handled the snakes would often disgorge a number of pollywogs.

When picked up they do not ordinarily attempt to bite, but have a fairly effective protection in their habit of giving off "a strong and offensive odor if handled" (Ditmars, 1907, p. 236) and of voiding excrement.

A female garter snake, secured July 31 on the Duffer Peak Meadow, altitude 8400 feet, contained eggs near the hatching point. Probably the young are born earlier on the open desert than at this altitude. At this date there were still patches of snow in the woods.

One morning early in July as we were walking through the sagebrush at the head of Big Creek (altitude 8000 feet) our attention was attracted by the excited "chips" of a pair of white-crowned sparrows (*Zonotrichia leucophrys leucophrys*). The cause for this excitement proved to be a garter snake which was crawling over their nest. Evidently it was after the young birds, but it did not appear to have captured any, as they were by this time old enough to escape.

Crotalus (species indet.)

Rattlesnake

Distribution.—Ten rattlers were secured, being distributed by locality as follows: Quinn River Crossing (4100 feet), 1; Big Creek Ranch (4350 feet), 1; Big Creek Cañon (5000 feet), 1; Granite Creek (4300 feet), 1; Leonard Creek Ranch (4300 feet), 2; Virgin Valley (5000 feet), 4.

Although *Crotalus lucifer* (Stejneger, 1893, p. 448) has been recorded from Pyramid Lake, the Truckee River, and from various localities farther east in Nevada, as well as from Utah, Idaho, and Oregon, I can by no means be sure that our examples are referable to it. They differ markedly from specimens of

lucifer in the Museum collection from the San Jacinto and San Bernardino mountains of southern California, and the task of finally determining their status must be reserved for some specialist of the future.

Habits.—Shortly after we started from Quinn River Crossing, June 8, our attention was attracted by the buzz of a rattlesnake beside the road. It resisted capture to the utmost, fighting desperately. In this respect it was different from several others secured later, which were very sluggish and could only with difficulty be induced to rattle.

While we were encamped at Big Creek Ranch a small rattler was brought in from Granite Creek, six miles north of Big Creek. On July 20 a *Crotalus* was killed in the garden at the Dugout Camp, 5000 feet altitude, in Big Creek Cañon.

A pair of snakes were taken at Leonard Creek Ranch. The two were lying very close together in some tall weeds, and had probably been copulating, as the male had one hemipenis protruded. These snakes rattled little and were particularly sluggish of movement.

The scarcity of rattlesnakes was to us surprising. Residents of the region testified to their greater abundance in former years.

THE BIRDS

Larus delawarensis Ord.

Ring-billed Gull

The only species of gull observed. On the first day of June an individual was noted fleeing down the Quinn River before the attacks of a belligerent avocet. No specimens were preserved.

Hydrochelidon nigra surinamensis (Gmelin)

Black Tern

Two black terns were observed on May 19 at Quinn River Crossing flying erratically and excitedly back and forth over the marsh. Possibly the species was breeding in this locality. No specimens were preserved.

Anas platyrhynchos Linnaeus

Mallard

Small companies of mallards were twice seen the last of May at Quinn River Crossing, and an individual was noted June 15 at Big Creek Ranch. One specimen (no. 9190) was secured.

Nettion carolinense (Gmelin)

Green-winged Teal

A male green-winged teal was shot on the Quinn River June 3. The next day a female of the same species was flushed from a nest, which was located in a depression on moist ground, and surrounded by the tall grasses of the marsh. The nest was composed of willow twigs and grass stems so loosely felted together that the structure could not be picked up intact. The cavity measured 127 mm. (5 inches) in diameter and 70 mm. (2¾ inches) deep. Four eggs were found in the nest, and one other on the ground at a distance of seven inches from it, probably having been carried there by the flushing bird. Strangely enough, no down feathers were noted anywhere in the vicinity.

Two specimens of green-wing teal (nos. 9104, 9105) were preserved.

Querquedula cyanoptera (Vieillot)

Cinnamon Teal

A single bird (no. 9106) was shot on a pool of the Quinn River on June 4.

Dafila acuta (Linnaeus)

Pintail

One pintail was noted flying over a marsh near Quinn River on May 31. The next day a flock of three was observed. No specimens were obtained.

Nycticorax nycticorax naevius (Boddaert)

Black-crowned Night Heron

One flushed from a bend in the Humboldt River near Winnemucca on May 11. No specimens were preserved.

Porzana carolina (Linnaeus)

Sora Rail

On May 22 one was flushed from a nest near Quinn River and flew heavily away to another part of the marsh. Built in an open bunch of marsh grass, the nest touched the water so that the bottom of it was damp. Marsh grass was its principal structural constituent, some of the stems being still green. The fragments incorporated into the lining were smaller than those in the main body of the nest. The whole structure was securely interwoven among grass-stalks which partly supported it. It was overshadowed and effectively concealed by a frail canopy of broken-down stems. The diameter of the cavity was 89 mm. (3½ inches), its depth 30 mm. (1$^{3}/_{16}$ inches). Ten eggs lay close together in it.

Fulica americana Gmelin

American Coot

On May 12 a single one was seen wading in the shallow water of the Humboldt River near Winnemucca. No specimens of this species were secured.

Lobipes lobatus (Linnaeus)

Northern Phalarope

A large flock was observed in a lagoon near Quinn River Crossing on May 19. The birds were resting on the surface of the water like ducks, and were surprisingly tame and unsuspicious. Upon the approach of the collector they drew closer together, forming a dense flock. At the discharge of the gun the birds flushed, uttering sandpiper-like notes as they flew. Several were wounded and others gathered around and alighted near them.

Four individuals were seen ten days later (May 29) wading about in a shallow lagoon, apparently looking for food.

So far as known to the writer there are no records of the northern phalarope for the vast extent of the Great Basin, the nearest on the east being from Colorado, and on the west from California. Furthermore, May 19 and 29 are exceptionally late

dates of occurrence of this migratory species anywhere at the latitude of Quinn River Crossing.

Four individuals (nos. 9107–9110) were preserved.

Steganopus tricolor Vieillot

Wilson Phalarope

Noted at Quinn River Crossing and Hot Springs, Thousand Creek Valley. The first individuals were observed on May 20, when eight were seen circling over a marshy meadow near the Quinn River. They were giving utterance to a peculiar nuptial (?) call-note, which may be transcribed as "oit! oit! oit!" possessing a nasal quality difficult to imitate, but somewhat resembling the croak of a toad (*Bufo lentiginosus*) during the breeding season. At the instant of utterance of the note the bird which is calling raises its head somewhat, pauses momentarily in its flight, and its throat bulges slightly. The females, which of course are in this species much the larger and more brilliantly colored of the two sexes, evidently uttered most of the call-notes. From this time on Wilson phalaropes were seen daily on the marshes along the river, it being a common occurrence to flush several individuals from some shallow still-water lagoon.

From observation of their actions we were led to believe that they were nesting some time before we had other evidence on the subject. One bird when flushed feigned lameness, and the phalaropes usually circled about the collector in small companies of two or three, seemingly excited over his presence.

On May 31 a male was flushed from a nest in the marsh. The bird flew a short distance and then seemed to fall wounded into the grass. Upon following it, the same decoying pretense was repeated several times. The nest contained two eggs, so was left on the suspicion that the set was not complete. By June 2 another egg had been laid. There had been little attempt at construction of the nest, which was located on a small island of moist ground and surrounded by short marsh grass. Careful examination showed that the dead grass stems had been collected in some way, either by scraping them up or fetching them in. The eggs rested in a slight depression in the accumulated material at a height of 19 mm. (¾ inch) above the ground. The size

of the open space in the marsh grass occupied by the nest was 57 mm. (2¼ inches) by 76 mm. (3 inches). The whole structure was damp.

At Thousand Creek a phalarope was observed carrying a worm in its beak. At the same location, on another occasion, the birds followed and swooped at persons crossing the meadows. It is altogether likely that they were breeding in this locality as well as at Quinn River Crossing. In all, twelve individuals were secured (nos. 9111–9119, 9303–9305).

Recurvirostra americana Gmelin

Avocet

Distribution.—Seen at Quinn River Crossing, Virgin Valley, and along Thousand Creek.

Habits.—The birds were undoubtedly nesting along the Quinn River. Whenever the hunter invaded the precincts of the moist wild-hay meadows two to seven avocets appeared and betrayed the greatest excitement. They circled about him, uttering wild cries somewhat resembling "clai! clai! clai!" and voiding excrement at intervals.

The same "bobbing" or "bowing" trait observable in so many waders was very evident in the avocets. One was noted sitting on the water of a lagoon tributary to the Quinn River. The bird in a truly ludicrous manner jerked its head up and down, abruptly thrusting it under water at intervals.

Difficulty of approach varied with the individual. Some birds were exceedingly shy, while others were not so much so.

Avocets evidently share with most other birds a dislike of owls. Three were seen pursuing a *Spcotyto* over a wild-hay meadow.

Two specimens (nos. 9103, 9318) were preserved.

Actitis macularius (Linnaeus)

Spotted Sandpiper

On May 11 one was noted on the Humboldt River near Winnemucca. Later at Quinn River Crossing single birds and flocks of as many as four individuals were frequently noted on the

banks of the stream. They were very tame, and would usually allow of a near approach before flushing.

A single specimen was taken at Thousand Creek flats.

Ridgway's observation (1877, p. 610) that the spotted sandpiper is probably, next to the killdeer, the most numerous wader in the Great Basin region is not borne out by our later experience. In the vicinity of Quinn River Crossing the Wilson phalarope must be accorded this distinction.

Specimens preserved, three (nos. 9080, 9081, 9302).

Oxyechus vociferus (Linnaeus)

Killdeer

Distribution.—Occurred generally in the neighborhood of streams and ponds. The highest point at which it was noted was the meadow on Big Creek (7000 feet). It was noted in Virgin Valley and on Table Mountain as well as in the Quinn River region.

Habits.—The birds are found not only on the marshes and on contiguous moist ground, but often also on high and dry ground somewhere in the neighborhood of streams.

A male juvenal (no. 9102) was secured at Camp no. 3, on the meadow on Big Creek (7000 feet). The specimen exhibits the juvenal plumage. There is little doubt that the species breeds in the region.

Oreortyx picta plumifera (Gould)

Plumed Quail

One of the rare birds of the mountains, occurring only above 5000 feet altitude. A female was flushed in the sagebrush of a cañon near Big Creek Ranch. A male was seen not far below the head of Big Creek (8000 feet), and a single individual was heard at 6000 feet altitude on Alder Creek. A large family, including about a dozen juvenals, was surprised July 20, on the meadow on Big Creek (7000 feet), where they had probably been drinking at a spring. The chicks were highly adept at hiding. No specimens secured.

Centrocercus urophasianus (Bonaparte)

Sage Hen

Distribution.—Observed commonly the last of June and thereafter in the mountains above 6000 feet. Most numerous on the broad flats of Leonard Creek. They were characteristic of Transition zone.

Habits.—In general habits sage hens much resemble the California quail. They allow of one's near approach before giving the slightest warning of their presence, making up for this a little later, however, through a series of explosive sounds made by the sudden rapid beating of many wings as the birds rise in flight. Occasionally individuals (these were frequently observed to be young birds) do not fly up with the others, but wait until a little later, giving the hunter a second series of momentary surprises. Often, too, the sage hens that flush last take a different direction from that followed by the main flock.

The manner of flight is characteristic. First there is the stentorian "whirr," and the birds fly away with wings rapidly beating and the body swaying from side to side. At intervals this is alternated with a sailing movement, performed by holding the wings extended and motionless. The latter seems to be the favorite manner of alighting, for they always sail just previous to coming to rest.

Usually the birds void some fecal matter shortly after leaving the ground, and as they fly utter a chuckling or clucking fowl-like note.

One individual was flushed and flew a short distance up a hillside, alighting on the bare ground. The observer, upon looking away for a moment and then attempting to make out the resting bird, was absolutely unable to do so. Later the sage hen was again frightened from the place where it had perched. There is little doubt that the colors exhibited by *Centrocercus* are effectively protective.

The crops and gizzards of three birds contained sagebrush leaves, insects, grass seeds, and grass stems.

One flock was observed on the ground near a stream. The sage hens were sitting close together and dusting their feathers

in a typical chicken-like manner. Although the birds were in plain view they merely remained quiet, holding their heads erect in a listening attitude. Two or three of them walked in a stately manner for a distance of a few feet, but it was some time before the flock took wing.

The birds were very numerous on the Leonard Creek flats, where the broad expanse of country covered by sagebrush, with streams intersecting it at intervals, furnished the necessary food and shelter for thousands.

Numerous small piles of sage hen droppings were noted in the higher parts of the mountains. The pieces of fecal matter are about an inch long and a quarter of an inch in diameter. They are light cream in color and pleasantly fragrant.

By June 23 the young were out and fully feathered (juvenal plumage). Up to this date, although we had been maintaining a sharp lookout for this big game bird, none was seen. It must be that they are extremely quiet and cautious during the brooding period. The largest flocks flushed, which were made up in many cases of about thirty individuals, were seen during the last days of July and the first week in August. At this time adults and young birds were traveling in company.

Zenaidura macroura carolinensis (Linnaeus)

Mourning Dove

Distribution.—Occurred commonly at almost every point touched by the expedition, being numerous in flocks May 11 at Winnemucca, along the Humboldt River; abundant in an alfalfa field at Amos; and observed daily at Quinn River Crossing.

Habits.—At the latter locality mourning doves were observed in flocks of from three to seven individuals. They were first heard on May 25, being in full voice by June 1. Two weeks later at Big Creek Ranch they were observed singly or in companies of two or three individuals.

As is usually the case, they were most commonly flushed along streams or near springs. One dove was observed perching on a dead pine branch at the head of Big Creek (8000 feet). A single individual was noted at the Duffer Peak Meadow (8400 feet).

Three nests were found, two at Big Creek Ranch, June 20, and the other at an altitude of 6500 feet on a sidehill in Big Creek Cañon, June 26. The first nest contained one fresh egg, the second was in process of construction, and the third held two eggs.

Cathartes aura septentrionalis Wied

Turkey Vulture

Observed at rather long intervals flying about over the open desert or in the vicinity of the foothills. A badger carcass attracted several of the scavengers to the neighborhood of the camp on Leonard Creek (6500 feet). No specimens taken.

Circus hudsonius (Linnaeus)

Marsh Hawk

An immature female specimen (no. 9314) was shot July 21 at Soldier Meadows Ranch.

Accipiter velox (Wilson)

Sharp-shinned Hawk

A few noted in the lower parts of the mountains, usually along some stream.

On Leonard Creek August 5 a fully feathered juvenal and an adult were seen in a grove of aspens. From time to time the young one uttered an exceedingly plaintive jay-like begging note, which the parent answered. No examples of the species were preserved.

Buteo borealis calurus Cassin

Western Red-tail

Noted only in the mountains, for the most part in their higher portions.

Two red-tails were observed flying about in the vicinity of some cliffs at an altitude of 6000 feet on Alder Creek.

A nest, probably one that had belonged to this pair, was found fifteen feet above the ground on a cliff near the stream. It rested on a shelf formed by a large outcropping of granite,

and had apparently been used this year (1909), as the white excrement both on the nest and on the sticks and rocks under it was comparatively recent. The structure was inaccessible to a climber without the aid of a rope. It was a very large mass, built of coarse sticks and twigs. Some of these had fallen and formed a little heap under the nest.

The limited pine-covered area of the highest ridges of the mountains was *Buteo's* favorite hunting ground. Four individuals were seen in the immediate vicinity of the wild crags of Duffer Peak.

Red-tails were twice seen with prey held in their talons, and on one of these occasions (see account of *Callospermophilus,* Taylor, 1911, p. 221) I was able to determine what the quarry was. The great strength of this hawk is instanced by its ability to break through the tough skull of *Callospermophilus trepidus.*

No specimens of the species were preserved.

Aquila chrysaëtos (Linnaeus)

Golden Eagle

Seen only in the higher parts of the mountains. One was observed near the summit of Duffer Peak on July 29 in the neighborhood of a company of western red-tails. The latter appeared to be somewhat afraid in its presence and to take care that it did not approach too closely.

No examples of the species were obtained.

Falco mexicanus Schlegel

Prairie Falcon

Observed at Quinn River Crossing, Big Creek Ranch, Big Creek Cañon at 7000 feet altitude, and Thousand Creek. On June 27 a nest was found in the latter locality. Two prairie falcons were seen flying in front of cliffs near a mud lake, and from their actions it was judged that they must have a nest with young nearby. Search revealed it on a rocky ledge, which proved inaccessible without a rope. The noise of young birds could be clearly heard. As approach was made to the nest the parents attacked the collector, flying at his head in a very

threatening manner. The nest was more closely investigated on the following day, when one adult bird only was seen in the vicinity, and the juvenals had apparently forsaken the nest.

Two examples of the species (nos. 9315 and 9316) were preserved.

Falco sparverius phalaena (Lesson)

Desert Sparrow Hawk

Distribution.—Occurred in small numbers almost everywhere along our route, its zonal range being Upper Sonoran to the highest Transition.

Habits.—Sparrow hawks were noted in the mountains, perching like lonely sentinels on limber pines, quaking aspens and convenient boulders. Two fully fledged juvenals were noted on July 17 in a grove of aspens near Alder Creek Ranch. On July 19 a family of adults and juvenals was observed flying about the cliffs of Little High Rock Cañon, Washoe County.

Four examples of the species (nos. 9083–9086) were preserved.

Asio wilsonianus (Lesson)

Long-eared Owl

A solitary owl of this species was noted at 7:30 p.m. on the evening of August 1, on the Duffer Peak Meadow. He was maintaining a lookout from a horizontal branch of a dead limber pine, and was calling at intervals with notes which sounded dismal and lugubrious. His stomach proved to be empty. This individual (no. 9189) was the only one observed.

Bubo virginianus pallescens Stone (?)

Western Horned Owl

A horned owl, presumably of this species was heard "whooing" about midnight on July 9. At this time we were encamped at an altitude of 7000 feet on Big Creek. The sound seemed to come from the rocks of a nearby butte. A second individual was flushed from an aspen on Alder Creek at 6000 feet altitude. On taking wing it was pursued some distance by a western warbling vireo. It disappeared in a grove of aspens up the

cañon a short distance, was flushed again and flew down the cañon far out of gunshot.

Oberholser (1904, p. 191) has recorded a specimen of *Bubo v. occidentalis* from Austin, Nevada. The American Ornithologists' Union Committee (1910, p. 175) has referred *occidentalis* to *pallescens*, the range of which is said to include all of the Great Basin region.

Speotyto cunicularia hypogaea (Bonaparte)

Burrowing Owl

Seen between Winnemucca and Amos, at Quinn River Crossing, and at Thousand Creek. On one occasion we saw one chased by three avocets, and on another by two western kingbirds. They were rather shy—seemingly they had good reason to be!

A nest was found at Thousand Creek in an abandoned badger hole. Seven young were seen near the mouth of the burrow. They came out just at sunset, and while they were disporting themselves the parents would sit on a nearby fence or sagebush and give the alarm if anything suspicious appeared. One of the youngsters, too, seemed to act in the capacity of sentinel, and was always the last one to re-enter the hole. By the middle of July the young owls had grown as large as the parents, and were able to fly fairly well. At no time were they observed very far from the nesting site.

Ceryle alcyon (Linnaeus)

Belted Kingfisher

A single individual was observed on a fence-post near the Humboldt River at Winnemucca.

Colaptes cafer collaris Vigors

Red-shafted Flicker

Distribution.—The flicker occurred commonly throughout the region, apparently being as much at home on the summit of Duffer Peak (9400 feet), as at Quinn River Crossing (4100 feet). Ridgway (1877, p. 555) found the species to prefer the deciduous trees of the lower valleys, but in our experience it was about

equally abundant in high and low localities, with the advantage if anything in favor of the higher ones. Its zonal range was Upper Sonoran to high Transition.

Habits.—The penetrating "yip! yip! yip! . . . . . ." call of *Colaptes* was frequently heard as early as 4:30 in the morning. Although they were occasionally noted on rocks, the pines and aspens were in the mountains the most favored perching places. The birds are of a rather curious temperament. I was able to attract one by making a squeaking sound with the lips. At Quinn River Crossing two birds were observed about an old hay stack. On May 17, upon the discharge of a shotgun in the near vicinity, a flicker burst from a hole in the side of this stack. Investigation showed the presence of a set of eight eggs rather advanced in incubation. There were practically no trees on the desert, and the flickers were evidently reduced to an extremity for nesting sites. The upper part of the stack overhung its base. About 1.52 meters (5 feet) from the ground was a hole 114 mm. (4½ inches) in diameter opening into a cavity 482 mm. (19 inches) deep. This cavity had been appropriated by the flickers. Ridgway (1877, p. 579) mentions the digging by the red-shafted flicker of holes in *cliffs* for nesting purposes. Evidently *Colaptes* is broadly resourceful!

A second nest was found more than a month later (June 24) at the head of Big Creek (8000 feet). The nesting cavity was in the decayed portion of a quaking aspen near the stream. The hole was 1.52 meters (5 feet) from the ground, and the cavity was 63 mm. (2½ inches) in diameter and 533 mm. (21 inches) deep. The nest contained six young birds a few days old and one egg within which was a chick that had been too weak to pip the shell. The young birds were resting on a bed of chips. The probabilities are that the flickers were nesting quite commonly in the wooded parts of the mountains. Individual birds were fairly numerous.

The presence of this species in a region in which no other woodpeckers occur is an indicator of its comparative hardihood and relatively superior adaptability.

Phalaenoptilus nuttalli nuttalli (Audubon)

Nuttall Poor-will

Distribution.—Observed on the open desert and in the mountains to an altitude of 7000 feet. Ridgway (1877, p. 567) found poor-wills ranging to 8000 feet. It was most numerous in the vicinity of Big Creek Ranch and Cañon. We found the species predominantly in Upper Sonoran zone.

Habits.—Poor-wills were flushed in the sagebrush in the vicinity of our lower stations, escaping by their characteristic erratic flight. Frequently a poor-will or a pair of them would appear in camp in the evening, perch with seeming stupidity for a few moments on the ground or on a convenient boulder sometimes within a few feet of the observer, and presently zig-zag away on an insect hunt.

Call-notes heard comprise the usual "poor-will! poor-will!" and a clucking call heard when the bird is flushed, which may be rendered by the syllables "quut! quut!"

Three specimens (nos. 9157–9159) were preserved.

Chordeiles virginianus hesperis Grinnell

Pacific Nighthawk

Distribution.—Occurred generally over the entire region. Most numerous along the foothills and upon the broad flats (6000 feet) of the mountains, its zonal distribution being chiefly Transition.

The American Ornithologists Union Check-list (1910, p. 199) does not include Nevada in the citation of the breeding range of *Chordeiles virginianus hesperis.* This record for northern Humboldt County thus constitutes a substantial extension of the breeding range as therein outlined.

Habits.—At Big Creek Ranch nighthawks were frequently seen flying overhead in broad daylight, sometimes even as late as ten or eleven o'clock A.M. They were observed in the evening flying about over the small lake on the Duffer Peak Meadow (8400 feet) capturing insects. At intervals they left the lake

and circled about through the pines, soon returning, however, and continuing their erratic flight over the water.

Seventeen individuals were seen circling over the broad Leonard Creek flats (6000 feet) in a manner resembling that of a gyrating flock of turkey vultures. As a rule the nighthawk moves its wings slowly. Its principal call-note, which may be rendered by the syllables "squee-awk!" is uttered immediately after it makes three short wing-beats. The process of "booming" is as follows. The nighthawk, being high in the air, sets its wings and dives rapidly earthward. When it reaches a point ten or fifteen feet from the ground it suddenly catches itself, the operation producing a most peculiar and indescribable buzzing or whistling sound, which constitutes the "boom." This note is in a measure analogous to the explosive sound made by the Anna hummer as it reaches the lowest point in its nuptial flight. After producing the boom the nighthawk remounts to something like its original height, repeating the maneuver only at irregular intervals.

Eggs were discovered June 25, on Thousand Creek.

Three specimens (nos. 9160, 9308, 9309) were secured.

Aëronautes melanoleucus (Baird)

White-throated Swift

Noted flying about the cliffs of Little High Rock Cañon. They were seen entering crevices, so may have been nesting. No specimens taken.

Selasphorus platycerus (Swainson)

Broad-tailed Hummingbird

Distribution.—Hummingbirds presumably of this species were noted as follows: at Big Creek Ranch, May 18 and 20; at intervals in the vicinity of the head of Big Creek; and at Leonard Creek Ranch, where they were buzzing in and out among the trees of the large poplar windbreaks.

Habits.—On July 1 a single specimen (no. 9082) was taken on a meadow at an altitude of 8000 feet. It was feeding about iris, which was blooming on the mountain meadows at this time.

When first seen it was executing a nuptial flight over a willow.

Later in the season the drying up of the iris and certain pentstemons on the exposed hillsides, together with the invasion of the region by bands of sheep, which caused an extensive spoliation of the flora, apparently drove the hummers to the neighborhood of the streams where flowers were more abundant.

Frequently the flight of the hummer becomes bullet-like in speed and directness, and it is truly surprising if not a little disconcerting to have the little fellow shoot past close to one's head.

One individual was seen chasing a rock wren. It pursued the wren persistently and belligerently, and at intervals appeared to strike it with its bill.

Our observations of the habits of this species accord in nearly every particular with those of Ridgway (1877, p. 561). Apparently the broad-tailed hummers make straight instead of undulating flights. It is confessedly difficult, however, to follow the course of such unusually rapid flyers, so perhaps a positive statement is not justified.

Selaphorus rufus (Gmelin) (?)

Rufus Hummingbird

A reddish hummingbird, presumably belonging to this species, was noted August 3 on Leonard Creek. It hovered for a moment near some willows by the stream about 6:20 o'clock in the evening, then was away like a flash. A week later an individual was seen buzzing about the alders at Big Creek Ranch. An immature specimen (no. 9301), not with certainty identifiable, was secured at Soldier Meadows, July 21.

Tyrannus tyrannus (Linnaeus)

Eastern Kingbird

An eastern kingbird was almost the first bird noted as we approached Big Creek Ranch, June 8. The bird was perching on a fence near an alfalfa field. The next day two more were seen, and one individual was taken. The other appeared to be a juvenal, but unfortunately it was not secured. The birds

were not shy. They were heard to utter but one call-note. It is probable that the birds had bred at Big Creek Ranch.

The point nearest to the Pine Forest Mountains mentioned by the American Ornithologists' Union (1910, p. 208) in its definition of the range of *Tyrannus tyrannus* is central Oregon on the north, and northern New Mexico on the southeast. Ridgway (1877, p. 532) noted this bird in the valley of the Truckee, western Nevada. This fact, together with our records, would seem to indicate that the Great Basin should be included in the range of the species.

Two specimens(nos. 8607, 8608) were secured.

Tyrannus verticalis Say

Western Kingbird

Distribution.—Typically a bird of the desert flat below 5000 feet altitude. Observed at Quinn River Crossing (4100 feet), Wheeler Creek (4300 feet), Big Creek Ranch (4350 feet), and Alder Creek Ranch (5000 feet), all the localities being in Upper Sonoran zone.

Habits.—The warlike nature of *Tyrannus verticalis* is indicated by the fact that five individuals were seen simultaneously fighting in air, and that one kingbird was observed giving vigorous pursuit to a Bullock oriole.

At Quinn River Crossing about May 20 two pairs were seen performing amorous antics, and shortly a nest was discovered in process of building on a fence rail near the river. By June 5 it was completed, and there were five eggs. It was saddled on the rail between two posts and built of strings and plant fibers. Long pieces of string and rags dangled from the nest. The site was on a hill-slope, there being no large trees nearby. The male (as was later proved) was bolder than his mate, who, instead of approaching very closely, hovered overhead during the examination of the nest. After the killing of the male another kingbird made its appearance, but was apparently driven away by the remaining bird.

Two kingbirds were seen on May 26 on Wheeler Creek, evidently mating. The species was quite commonly observed at Big Creek Ranch. A nest with five eggs was found at this locality

June 14. Attention was attracted to it by the agitation betrayed by the pair of birds when the collector appeared in the neighborhood. The nest was located twenty feet from the ground, and within two feet of the top of a willow. It was saddled on top of an abandoned oriole's nest. The cavity was 76 mm. (3 inches) across and 51 mm. (2 inches) deep. One of its outer edges had a frayed appearance. A third nest containing one young bird in the juvenal plumage barely able to fly was found July 17 at Alder Creek. This nest was twelve feet up in an alder, and was constructed very much like the others.

Sayornis sayus (Bonaparte)

Say Phoebe

Distribution.—Noted at nearly all the camps below 5000 feet altitude. Evidently the bird does not invade Transition.

Habits.—Very few Say phoebes were observed. One family noted at Big Creek Ranch was made up of the parents and three young ones. The adults were usually out foraging. A broad cross-beam in the open wagon-house was the favorite and almost constantly occupied perch of the juvenals. They sat close together to keep warm, the two of them on the outside facing in one direction, the one in the middle in the opposite direction. At intervals they uttered a plaintive call-note something like "peear! peear!" Ridgway (1877, p. 535) renders it "peer, peer." They had nearly completely acquired the juvenal plumage. One of the birds left his position on the beam for a few moments and made a short flight, capturing an insect.

Nuttallornis borealis (Swainson)

Olive-sided Flycatcher

One was seen on June 3 at Quinn River Crossing. Six days later a second bird was observed on a dead alder by the stream at Big Creek Ranch. No examples were secured.

Myiochanes richardsoni richardsoni (Swainson)

Western Wood Pewee

Distribution.—Seen in the following localities: Quinn River Crossing (4100 feet), Big Creek Ranch (4350 feet), and head of Big Creek (8000 feet).

Habits.—The western wood pewee was typically a bird of the flat, though it was not numerous anywhere. The birds were seen in varying situations, for example, on fences about the Quinn River Ranch, and in willows along the river itself. Ordinarily they were shy.

On June 29 an individual was observed at the head of Big Creek (8000 feet) proceeding gradually up the valley in which our camp was located. It stopped to rest for a few moments on almost every naked top twig of the quaking aspens. The birds were more in evidence along a fence near the tree-lined stream at Big Creek Ranch, than at any other locality visited.

That there is a vertical migration among the western wood pewees during the early summer seems quite probable. Such a movement seems to exist in the black-headed grosbeaks, Wright flycatchers, western lark sparrows, and white-crowned sparrows in this region. Our data upon this point is so limited, however, that no certain laws of movement may be formulated.

Empidonax trailli trailli (Audubon)

Traill Flycatcher

This flycatcher was one of the less common species, being found at Big Creek Ranch only.

The birds were noted only three times, being heard in a thicket along the creek below the ranch. In this region the stream flows rather slowly, and the vegetation surrounding it is of the river-bottom type, which these birds so commonly frequent in other parts of their range.

One specimen only (no. 8560) was taken.

Empidonax hammondi (Xantus)

Hammond Flycatcher

Our only record of the species is that of a specimen (no. 9251) taken in Virgin Valley on June 2.

Empidonax wrighti Baird

Wright Flycatcher

Distribution.—Noted at Quinn River Crossing (4100 feet), Big Creek Ranch (4350 feet), head of Big Creek (8000 feet),

Duffer Peak Meadow (8400 feet), Alder Creek Lake (7800 feet), Alder Creek (7000 feet), Virgin Valley (5000 feet), and Leonard Creek (7500 feet and above). Occurred everywhere in the higher portions of the mountains.

Habits.—As regards note, song, and habits this flycatcher seemed to be identical with the bird from the San Bernardino Mountains of southern California called *E. griseus* by Grinnell (1908, p. 78). During the latter part of May several of the birds were observed in the tall sagebrush along Wheeler Creek near Quinn River Crossing. The first one was seen at this locality May 22; the last June 2. Presumably there occurred a vertical migration about this time or soon thereafter, for none were observed during the last week of our stay at Quinn River Crossing, and only a few were noted at Big Creek Ranch (June 9 and 10), while higher in the mountains a few days later they were common.

One individual seen at Quinn River Crossing was killing a grasshopper by pounding it on a sagebush twig.

This flycatcher was observed in limber pines on hillsides and high ridges, in quaking aspens along streams, in the mountain mahogany on arid ridges and cañon slopes, and in brushy plants generally. The bird seemingly prefers bare twigs to those fully leafed out, being very often seen perching on exposed branches. When heard calling from a dense thicket of quaking aspens, for instance, it is generally found to be, not in the thickest part of the foliage, but on a naked twig rather low down in the tangle.

The evident excitement of a bird seen on June 29 above Alder Creek Lake doubtless indicated the presence of a nest nearby. This individual persisted in remaining in a very circumscribed locality.

The flycatchers seem by nature curious, and seek to determine the source of a strange sound. Frequently a "squeaking" sound made with the lips would attract one to within a few feet of the observer. As soon as the bird discovered the source of the peculiar note it usually retired in great haste. Ridgway (1877, p. 542) says this flycatcher is confiding and unsuspicious, but in our experience it was shy.

Two nests were discovered, the first on July 1 at the head of Big Creek in an aspen thicket. The nest was built against a large limb, being supported by two smaller branches and fastened with sheep's wool. It was three and a half feet above the ground, its cavity being 53 mm. ($2\frac{1}{10}$ inches) in diameter and 38 mm. ($1\frac{1}{2}$ inches) deep. The nest contained four eggs in so late a stage of incubation that their preservation was impossible. The second (found July 9 on Big Creek, altitude 7000 feet) was in process of construction. The body of the nest was being built up of thin strips of quaking aspen bark, and its fastenings to the limb were of spider-web. It was about half completed; no lining had as yet been put in. The nest was four feet above the ground. The female was carrying on the building process. She came three times during a few minutes, and, while sitting on the nest, added material with her beak, all the while uttering a series of "ker-wit" call-notes, and occasionally notes of different inflection. The male bird was shyer and more quiet. He was not observed aiding in the work of construction.

Otocoris alpestris merrilli Dwight

Dusky Horned Lark

Distribution.—Occurred at nearly all the lower stations visited, following up the broad Leonard Creek flats to 7000 feet. Its habitat thus falls within Upper Sonoran and Transition.

It is perhaps significant to note that certain of our observations with reference to the distribution of this bird do not accord with those of Ridgway (1877, p. 499). In our experience, instead of being omnipresent, equally abundantly in all localities, the horned larks exhibit a very marked preference for the vicinity of the fields and dry meadows, as along Quinn River. The birds were frequently encountered, however, on the most inhospitable deserts, although they were more numerous in pleasanter surroundings. We did not observe them at a greater altitude than 7000 feet, although Ridgway noted them as high as 11,000 feet.

Habits.—The mode of flight is quite characteristic. The wings are vibrated rapidly a number of times in alternation with short periods of soaring.

After May 12 the birds were in pairs, and singing persistently and cheerily. On June 4 an individual was observed pursuing another, possibly mating. A large flock of some twenty-five or thirty individuals, including both adults and young birds, was encountered at the mouth of Alder Creek, July 17, and on August 4 another flock of about the same size was observed near the broad divide (7000 feet altitude) between Leonard and Big creeks. Flocking had evidently commenced by the middle of July.

Pica pica hudsonia (Sabine)

American Magpie

Distribution.—During the early summer magpies occurred in small numbers at nearly all the stations below 6000 feet. Later they were found along streams in the mountains to a height of 8500 feet.

The birds were breeding just on the line between Upper Sonoran and Transition, evidently invading the latter zone in their daily wanderings.

Habits.—From the point of view of the hunter, to approach the bird was practically impossible if a shotgun was exhibited. Its sagacity was the most notable trait of the magpie. One morning as I was setting a mouse-trap by a willow thicket, I was startled to hear a vigorous chattering. In the thicket a few feet from me was a magpie, the personification of surprise. The bird did not linger, but speedily made off, chattering until out of hearing.

While for the most part the magpies were confined to the immediate neighborhood of streams, individual birds were seen on the arid sage-slopes of the mountains or on the sage-covered desert. In no case, however, were they observed far distant from a visible supply of water. As is commonly the case with other species, the magpies were represented at the higher altitudes and at points farthest from their natural habitat by young birds.

Two nesting colonies were found, one in the mouth of Chimney Creek near Amos and the other in the foothills of the Pine Forest Mountains near Big Creek Ranch. There were five nests in the first colony, which was discovered May 13. One was

located ten feet up in a willow thicket. It was built of large coarse sticks and lined with fine dry rootlets, mud having been freely used in cementing the structure together. Above the nest proper was a roof-like arch, of sticks. This made the nest very conspicuous. The top of the nest proper was not horizontal, but slanted toward the south. There was considerable fecal matter about and on it, and it consequently had a very disagreeable odor. The nest cavity was 203 mm. (8 inches) in diameter, and contained six eggs. A second nest was built in an elder (*Sambucus glauca*). Its height above the ground was the same as that of the one just described. This nest was built in every way like the first except that the dome over it was constructed of thorny rosebush twigs, which formed a rather open cover. This nest had no definite opening, there being several possible entrances on the south. Contained in it were three young birds, with juvenal feathers just appearing, and three eggs. Another juvenal was found dead on the edge of the nest. The second colony of magpies had all built in quaking aspens. These nests had been occupied earlier in the season (they were found June 15). Companies of adults and juvenals were several times heard in their vicinity. The preferred height for nests was eight to fifteen feet above the ground. The adults and young were traveling about in company during the latter part of June and the first of July. Frequently from thickets along a stream two unlike series of harsh "squawks," evidently indicative of the progress of feeding operations, would be heard, the squawks being referable to parent and young one respectively.

Aphelocoma woodhousei (Baird)

Woodhouse Jay

One was flushed from a willow-thicket near Quinn River. This (no. 9093) was the only jay seen. Hoffman (1881, p. 234) found this species rather common in Nevada.

Corvus corax sinuatus Wagler

Western Raven

Noted only at Quinn River Crossing and Big Creek Ranch. Individuals were several times seen and heard about the former

locality, our attention often being attracted to them through their persecution by red-winged blackbirds. No specimens taken.

Nucifraga columbiana (Wilson)

Clarke Nutcracker

Distribution.—Observed commonly above 7000 feet in the mountains. They were closely confined to the pine-covered area, and were consequently more numerous on the western than on the eastern slopes. The nutcracker was a characteristic inhabitant of that part of the Transition which is designated (see pl. 7) as possessing a Boreal infusion.

Habits.—The birds were first noted at the head of Big Creek. Small companies of three or four individuals appeared, and perching on boulders and dead pines on the mountain sides, they proceeded to call back and forth to one another. As regards degree of shyness there was much individual variation.

Several birds were dissected and their stomachs found to contain insect remains, principally a large species of ant common in logs at high altitudes. Sometimes a mixture of insect remains and pine-nuts was discovered. Individuals were frequently observed pounding pine-cones to extract the seeds. Others were noted prying and tearing strips of bark from dead pines, evidently searching for insects.

By making a "squeaking" sound with the lips I attracted one individual to within ten feet of me. As long as I remained quiet he remained near at hand. For several minutes he watched me intently, making little nervous movements from time to time. Presently he uttered several loud jay-like notes, and went to work at stripping off bark.

These birds were the noisiest of all the species in the higher parts of the mountains. They could be heard calling at almost any time of day. Toward the last of July the young were out of the nest and seemed to be accompanying their elders.

A parent was twice observed feeding a juvenal by the process of regurgitation. The juvenal begged by flapping its wings in a linnet-like manner, and uttering a loud squawking. When the parent inserted its bill into that of the young bird the cries of the latter became increasingly violent. At intervals the adult

took short rests, turning her back to the young bird for a few moments. Three or four feedings to the visit were administered. Bare horizontal branches of the limber pine were selected as the scene of the process. The pumping motion of the adult during the regurgitation did not seem to be as vigorous as that of the linnet. The throats of the parent and juvenal were found to be full of hulled pine-nuts. Once I observed a young one persistently pursuing a parent, apparently attempting to coerce the latter into feeding it.

Dolichonyx oryzivorus (Linnaeus)

Bobolink

A single individual in full song observed June 3 at Quinn River Crossing. The bobolink is said in the American Ornithologists' Union Check-list (1910, p. 231) to breed in northeastern Nevada. The single individual secured by us (no. 8834) had the enlarged testes significant of breeding activity.

Molothrus ater artemisiae Grinnell

Nevada Cowbird

Distribution.—Three individuals were seen on the out-buildings of the Sod House Ranch. The yards of the Quinn River Ranch and the willows of Big Creek Ranch were the only other localities at which the cowbird was observed (see Grinnell, 1909, p. 275).

Habits.—Cowbirds were frequently seen flying rapidly up or down the course of Wheeler Creek, near the Quinn River Ranch. Solitary individuals were sometimes observed flying over this course, but usually the birds were in two's and three's. Frequently they gave voice to their peculiar shrill "screep," uttered with an ascending inflection; another of their call-notes may be described as a "cluck, cluck" made in the throat and executed simultaneously with an opening of the mandibles. From their actions during the last of May it seemed evident that mating was taking place.

At times the birds were extremely tame. One morning, while I was walking from the Quinn River Ranch towards camp, two

of the birds were seen on a fence near the road. The male left the vicinity, but the female allowed of my approach to within eight feet.

The cowbirds seemed to offend the sensibilities of the Brewer blackbirds in some way, as the latter were not infrequently observed giving vigorous chase to males or females of the former. The greater proportion observed were males.

On June 15 a single cowbird's egg was found in a song sparrow's nest, together with two eggs of the rightful owner.

Twelve specimens (nos. 8822–8833) were preserved.

Xanthocephalus xanthocephalus (Bonaparte)

Yellow-headed Blackbird

Distribution.—Observed at Tregaskis Well and Quinn River Crossing only.

Habits.—While we were stopping over between stages at the Well, a yellow-head flew in and perched on a haystack near the barns. The locality is in the middle of a very wide expanse of extremely arid desert, and it seemed strange to encounter here such a denizen of the tules.

Two individuals were seen in company with a flock of red-wings at Quinn River Crossing on May 20. A nesting colony was discovered two days later in the extensive wild-hay fields along the river, which are covered with a thin sheet of water in the spring and early summer, but which are left high and dry later in the season. During May and June various species of water-birds take advantage of these intermittent marshes. Willows, wild hay, many small species of water-loving plants, and a very few tules make up their flora. A few pairs of yellow-headed blackbirds were nesting in the solitary tule patch discovered here.

Two nests were found May 22, one 152 mm. (6 inches) above the water, the other almost touching its surface. They were made entirely of dry strips of tule, being lined with very fine shreds of the same material. The nests were fastened in such a way that they could easily be slipped up and off the reeds. The first contained one egg; the second three. The cavity of the latter measured 76 mm. (3 inches) across and 72 mm. (2⅝

inches) deep. A third was found on May 31 three feet above the water in the same clump of tules. It was about the same size, contained two eggs, and was made and fastened in the same way as were the others.

On June 1 the birds were heard in full song.

Although it is not rare, *Xanthocephalus xanthocephalus* cannot be said to be a common species in the region, probably because the type of environment to which it is suited is so restricted.

Agelaius phoeniceus (subspecies indet.)

Red-wing

Distribution.—Common in almost every locality which was at all suitable for their habitation. Specific localities at which they were noted: Winnemucca (4300 feet); Quinn River Crossing (4100 feet); Big Creek Ranch (4350 feet); Alder Creek (5000 to 7000 feet); Virgin Valley (4700 feet); and Little High Rock Cañon (5000 feet).

This bird is considered by Mr. Grinnell to be nearest *Agelaius p. sonoriensis*, though it is said not to be that form.

Habits.—On more than one occasion was the belligerent disposition of this blackbird in evidence. Flocks of four to eight individuals were frequently seen pursuing some distressed raven; they swooped at the fleeing bird with every appearance of intent to do bodily harm, but I was not able to observe that they did actually strike the fugitive. Individuals do not seem to be particularly timid about attacking a raven, even when no other red-wings are about. Magpies come in for a share of abuse. Apparently the red-wings do not confine their attacks to birds of their own size or larger, for one was observed driving a Savannah sparrow from a grass stem. Upon the flight of the sparrow, the blackbird settled down on the vacated perch.

The male apparently guards the female and nest very carefully. If the female flies up from the grass he often follows her with tail and wings widely spread, singing most persistently. If another male intrudes he is immediately attacked and ejected. The males are much more in evidence than the females.

Both this species and *Euphagus cyanocephalus* showed very

ragged plumage the last of May and the first of June. Some of the individuals preserved had the crowns of their heads almost naked.

At Quinn River Crossing the red-wings were found in a slightly different habitat from that occupied by the Brewer blackbirds. In general they (the red-wings) were more restricted to the open meadows, alfalfa fields, and low willow thickets along the river than were the Brewers, which had a much wider distribution, being found about the ranch buildings, in thick tangles of willow and wild rose along the river, and on the nearby sagebrush flats. The habitats overlapped, however, to a great degree. Red-wings were commonly seen along creeks and in the sagebrush in Virgin Valley.

Our work was carried on during the nesting season. The first nest, discovered May 22, contained four fresh eggs, and was located in a bunch of marsh grass in the middle of an arm of a meadow near Quinn River. The water was 127 mm. (5 inches) deep, the nest being woven among the grass stems 13 mm. (½ inch) above the surface. Although the bottom of the nest was damp, the inside was perfectly dry. It was constructed exteriorly of marsh grass, being lined with finer material of the same sort. Its inside diameter was 76 mm. (3 inches), depth 63 mm. (2½ inches). On May 24 three more nests were found in situations practically similar. All contained sets of four eggs. The eggs of the one taken proved to be fresh. The nests were located at a height of 101 to 152 mm. (4 to 6 inches) above the surface of the water, and were constructed practically as the one described.

A nest containing small young was found a week later. It was built 304 mm. (12 inches) above the surface of the water in a grass tuft. Unlike those thus far considered, it was made of dry reeds entirely, graduated from coarse to fine as the lining was approached. On June 4 a nest was discovered containing three eggs and two small young. This was the only case in which a set of five was recorded. Of a half dozen other nests of the species found, no deviations of significance from the observations above recorded were noted. In some instances the nests were supported by reeds instead of being placed in grass

tufts, and in individual cases horse-dung had been freely incorporated into the structure.

While investigation of the nest was going on the parents were always much agitated and kept up a continual series of objections in the form of nervous circular flights and excited call-notes.

Four juvenal red-wings were noted flying up Alder Creek, at an altitude of 7000 feet, which was the highest point at which *Agelaius* was observed.

Sturnella neglecta Audubon

Western Meadowlark

Distribution.—Occurred generally along the route of the expedition in suitable situations, being recorded at nearly all the stations of lesser altitude.

The meadowlark was most numerous on the ranches, in the alfalfa and wild-hay meadows, but ranged rather commonly to a height of 7000 feet in the mountains, and individually to a still greater altitude. One was observed on June 29, flying about from boulder to boulder, giving its call-note, at 8500 feet altitude. Ridgway (1877, p. 506) recorded it to an altitude of 7000 feet.

Habits.—At Quinn River Crossing the song of the meadowlark was the one most in evidence. Especially in the early morning the beautiful notes rang out over the meadows in the neighborhood of the ranches and on the sagebrush-covered ridges of the foothills.

One meadowlark was seen in the morning at Quinn River Crossing giving vigorous chase to another individual of its own species. After having ejected the interloper he returned to his particular section of alfalfa field.

Two nests were found at Quinn River Crossing. The first was discovered May 26 in an alfalfa field northeast of the ranch. The nest was in a depression in the grass, and was composed of straw, and lined with grasses. The bird flushed from this nest as the collector came into the vicinity, feigning an injury after having retreated to a distance of several yards. A second nest was discovered on May 31 in the marsh near the Quinn River. The bird flew out almost from under the feet of the

hunter, disappearing from view across the river. This nest rested in a slight depression on some moist ground, and was surrounded by marsh grasses. It was nearly spherical in shape, being built entirely of straw, and having a light covering arranged over it in such a way that the opening was on one side. It was especially well concealed and one could hardly see how the parent bird got into and out of the nest, as immediately in front of the opening were some dry willow branches. The opening into the nest was 76 mm. (3 inches) in diameter, and the nest cavity 127 mm. (5 inches) from front to back. Each nest contained five fresh eggs.

Meadowlarks were present in small numbers on the Leonard Creek flats, altitude 6000 feet, but were characterized by extreme shyness, retreating hastily into sagebrush thickets when surprised.

A juvenal barely able to fly was noted in Big Creek Cañon between the Dugout Camp and Big Creek Ranch on June 22.

Icterus bullocki (Swainson)

Bullock Oriole

Distribution.—Observed fairly commonly at lower stations, for example, Winnemucca, Quinn River Crossing, Virgin Valley, Little High Rock Cañon, and Leonard Creek Ranch. The highest record stations were Big Creek (6000 feet), Leonard Creek (6500 feet), and Duffer Peak Meadow (8400 feet), while the lowest was Quinn River Crossing (4100 feet).

Habits.—Orioles were by no means confined to the willows, but were often seen in the sagebrush, though never at any great distance from some stream. Nests were seen May 11 in the poplars at Winnemucca. The males were at that time in full song. Nests, but no birds, were observed at Amos. Orioles were nesting in the willows at the mouth of Wheeler Creek and probably at Quinn River Crossing also.

Detailed observations of breeding habits were made at Big Creek Ranch, where the orioles were more numerous than at any other locality on our itinerary. One nest, which may be regarded as fairly typical, was located fifteen feet up in a willow.

It contained five fresh eggs, and was well built, being a firmly woven felt work of horse-hair, willow-cotton, and plant fibers. The nest was 104 mm. (4⅛ inches) by 60 mm. (2⅜ inches) across the opening. Average inside diameter was 136 mm. (5⅜ inches). The parents scolded vociferously at my intrusion. They were exceedingly cautious, however, and took care to keep out of firing reach. Orioles were several times seen chasing Brewer blackbirds from the vicinity of their nests. Families made up of both young birds and adults were noted at Alder Creek Ranch on June 17.

Euphagus cyanocephalus (Wagler)

Brewer Blackbird

Distribution.—Noted at every collecting station visited by the party, the species occurring from Quinn River Crossing (4100 feet), to Duffer Peak Meadow (8400 feet).

Habits.—A colony of thirty Brewer blackbirds was seen in the willows on a meadow at the head of Leonard Creek (9000 feet). Large flocks were observed on the Duffer Peak Meadow (8400 feet) also. Small companies were frequently noted apparently crossing the mountains. They did not fly continuously for any great distance, but rested at intervals on convenient boulders or quaking aspens.

Two individuals were seen at Quinn River Crossing giving chase to a cowbird, but on the whole the Brewers seem to be not nearly so pugnacious as their red-winged cousins.

On May 13 at Amos individuals were observed mating. Six days later, at Quinn River Crossing, Brewer blackbirds were found nesting in the willow and bramble thickets along the stream. Whenever a nesting site was approached the birds always set up a vociferous chattering. The nests were situated at a greater distance (2½ to 6 feet) from the ground than those of the red-wing. We found very few blackbirds, however, nesting in trees, whereas Ridgway (1877, p. 510) observed several nests twelve to fifteen feet above the ground, in piñons and junipers.

On June 10 a colony was found at Big Creek Ranch. Six nests were discovered in a sagebrush area 50 by 150 feet in size.

Several others were noted in willow thickets farther down the creek. The six nests examined contained eggs as follows: 5, 6, 2, 3, 6, and 5 (probably the sets of two and three were incomplete). In one set collected there was a notable difference in degree of development of the eggs, one being fresh and the others in various stages of incubation, possibly indicating that more than one day elapses between the successive depositions, and that incubation commences as soon as the first egg is laid. One of the sets collected June 10 was in a late stage of incubation. The nests were fairly close together, and some were built almost over the stream while others were built 150 feet away from it. They were not well concealed. The blackbirds congregated in a flock of a dozen or more and scolded continuously while we were in the vicinity.

Carpodacus cassini Baird

Cassin Purple Finch

Distribution.—Occurred rather commonly above 7000 feet altitude in the mountains.

Habits.—Two individuals were observed feeding in the foliage of a quaking aspen at 7500 feet altitude. Especially cold mornings seemed to drive the birds to slightly lower altitudes. Purple finches were in full song at the head of Big Creek June 24. They continued singing until about the last of July, when they became very quiet and correspondingly inconspicuous. Our observations with regard to the singing powers of the young males in the dull plumage of the first winter accord with those of Ridgway (1877, p. 457), who asserts that they sing almost if not quite as vigorously and sweetly as those in the adult livery. On several occasions purple finches were heard singing while in flight.

A nest was found June 26 in a *Pinus flexilis* near the head of Big Creek. The tree itself was surrounded by a grove of quaking aspens. The nest was located five feet from the trunk of the pine on the slender twigs of a branch thirty feet above the ground. Sticks and greenish yellow lichens had been used in its construction. The lining consisted of shreds of bark and sheep's wool. The structure was rather frail and loosely built. The depth of the cavity was 30 mm. ($1\frac{3}{16}$ inches), its diameter

79 mm. (3⅛ inches). When it was first noted one parent was seen on the nest, but when a close examination of the site was made neither bird was seen. There were five young in the nest.

Young birds out of the nest were noted as early as the middle of July. Upon their appearance purple finches were very much in evidence on the highest ridges in the mountains (altitudes of 9000 feet and above). The juvenals kept up a continuous vociferous clatter. A bird would fly from one tree to another and then the other members of the family would follow. Feeding of the young was by regurgitation. It was very easy to approach the females and juvenals, but the brilliantly colored males were more cautious.

Carpodacus mexicanus frontalis (Say)

Linnet

Distribution.—Noted at all the lower stations touched by the expedition. It invaded Big Creek Cañon to an altitude of 6000 feet. Localities where it was observed may be enumerated as follows: Winnemucca, Quinn River Crossing, Big Creek Ranch, Alder Creek Ranch, Leonard Creek Ranch, and Virgin Valley. All of these are in Upper Sonoran life zone.

Habits.—Linnets were common at the localities listed. In habits they seem to vary somewhat from those of southern California. Their songs particularly appear to have a slightly different inflection. It may be that the different environmental setting has some acoustic influence on the effect of the song, but I do not believe the difference is entirely accounted for in this way.

They were perhaps more abundant at Big Creek Ranch than at any other place visited. Individuals were often heard on the sage-covered hill slopes. It is probable that they scattered out over the foothills to feed.

Birds were seen in copulation June 14. Young linnets were seen July 17 at Alder Creek Ranch.

The birds were shy at all times, and nine specimens only (nos. 8670–8676, 9284, and 9285) were secured.

It is of interest to note that *Passer domesticus* was not found at any locality away from the railroad. As is well known, where

the English sparrow is common the linnet comes to be almost displaced.

Astragalinus psaltria hesperophilus Oberholser

Green-backed Goldfinch

Notably rare. On June 9 one was heard near Big Creek Ranch. The clear call-note of a second individual was heard the next afternoon, as the bird was flying overhead. Finally one (no. 8606) was secured in the willow thicket below the ranch.

Spinus pinus (Wilson)

Pine Siskin

Distribution.—Heard at Quinn River Crossing, Big Creek Ranch, in the higher parts of the mountains, and in Virgin Valley.

Habits.—The shyness of the species in this region is indicated by the fact that although several individuals were heard, no specimens were secured by our immediate party, and only one (no. 9280) by the palaeontological division in Virgin Valley. The usual thing was to note them flying high overhead, their presence being indicated merely by their clear-voiced call-note. On June 2 one individual was observed at 6 a.m. flying westward. Later in the day a pair was seen and shortly afterward an individual bird flying in the same direction.

At Big Creek Ranch and in the mountains siskins were noted perching on willows along the stream and in the brush on the hillsides.

Several individuals were observed feeding in a warbler-like manner, picking insects from the foliage of a limber pine.

Pocœcetes gramineus confinis Baird

Western Vesper Sparrow

Distribution.—Noted at Big Creek Ranch and locally on the sagebrush flats of the mountains rarely above 7000 feet altitude; zonally in Upper Sonoran and Lower Transition.

Habits.—Vesper sparrows were not abundant. They were unusually shy and difficult of approach, as they flew over long

distances before making the characteristic flirt downward into the sage and to the ground. As the birds dropped to the ground they dodged either to the right or to the left behind a sagebrush. Sometimes they remained motionless after alighting, but usually they ran along for some distance. In either case they were generally highly successful in eluding pursuit. When followed persistently the flights became longer.

One female secured July 9 had a bare breast, indicating that she was brooding. This, together with the taking of a juvenal bird on July 28, gives a clue to the time of nesting. The young bird was noted in company with a sage thrasher and several Brewer sparrows in a sagebrush flat at the head of Big Creek (8500 feet).

By the first week in August the post-natal aggregation had begun to be apparent, and flocks of from three to seven birds were seen.

Five examples of the species (nos. 4677–4680) were preserved.

Passerculus sandwichensis alaudinus Bonaparte

Western Savannah Sparrow

Three specimens (nos. 8780, 9277, 9278) were obtained. These birds, which were evidently migrating, were taken at Quinn River Crossing and Virgin Valley, May 14, 15, and 22, respectively.

Passerculus sandwichensis nevadensis Grinnell

Nevada Savannah Sparrow

Distribution.—Noted at three localities only: Quinn River Crossing, Big Creek Ranch, and Leonard Creek flats. These stations are in Upper Sonoran zone.

Habits.—This species was a very common one in the grassy marshes, in the wild-hay meadows and in the willows along the Quinn River, and also in the alfalfa fields of Big Creek Ranch.

At long intervals the birds ventured out from the grass of the meadows into nearby sagebrush. A single juvenal was secured at an altitude of 6500 feet on Leonard Creek. It had evidently followed up the stream. The only meadows in the vicinity were

particularly unattractive, being very dry by this time (August 3). The adults did not venture away from the ranches.

The striking similarity between the habits of *Passerculus* and those of *Melospiza* was very evident. This extended to appearance, movements, song, and habitat. There was one marked difference between the two, however, in the latter regard. While the song sparrows were confined almost exclusively to the willows along the Quinn River, the Savannah was found alike in this situation and in the grass of the marsh.

A single nest was found, May 24. The female was flushed from it and flew heavily away, feigning injury. The structure was located in a slight depression on a low hummock in the marsh, being completely surrounded by mud and water. The grass about it was sparse. The nest had been built between a large clod of earth and a piece of cowdung, and was composed of coarse pieces of wild hay and marsh grass, and lined with fine grasses and threads of horsehair. Dimensions of the cavity were: diameter 54 mm. (2⅛ inches), depth 42 mm. (1⅝ inches). It contained five eggs, the incubation of which was just begun. Both parents remained near while the nest was being examined.

Twenty-five specimens of this new form (see Grinnell, 1910, p. 311) were obtained.

Chondestes grammacus strigatus Swainson

Western Lark Sparrow

Distribution.—Generally distributed over the desert from Winnemucca to Alder Creek Ranch. It was not noted above 7000 feet altitude. Its habitat is apparently exclusively within the Upper Sonoran life zone.

Habits.—Lark sparrows were in full song from the last of May well into June. One bird was observed on an alder on Big Creek with two grasshoppers in its mouth. Parents with young in juvenal plumage were observed on the sage flats of Big Creek Cañon the first week in July. There is little doubt that the species was nesting in the region.

It may be that the birds move from the flats to the foothills for nesting purposes, for while they were commonly observed at Quinn River Crossing before May 22, after that date they be-

came less abundant. A few days later they were found to be common at Big Creek Ranch and in the cañons and on the lower ridges nearby.

Zonotrichia leucophrys leucophrys (J. R. Forster)

White-crowned Sparrow

Distribution.—Occurred quite generally. Noted at Winnemucca on May 11; seen near the stage road between Tregaskis Well and Quinn River on May 15; rarely observed at the latter locality; one heard singing in a low, dry cañon at the mouth of Wheeler Creek, several miles to the eastward. After May 26 none were seen at the lower altitudes. The birds retreated about this time to the highest parts of the mountains to breed. Here they were often seen in the sagebrush, in willow tangles over springs, in the low chinquapin patches, and in gnarled quaking-aspen thickets.

Habits.—The birds were in full song and probably nesting commonly June 23 to August 4. The first nest (with young birds which had already assumed juvenal plumage) was found on July 3 near the head of Big Creek. (See account of garter snake, p. 354). The nest was located a foot and a half above the ground in a sagebush. It was securely fastened, and fairly well concealed. The cavity was approximately 88 mm. (3½ inches) across, and 63 mm. (2½ inches) deep. The nest was a substantial structure built of dry grass stems, light sage twigs, sage bark, and dry blades of grass. A pair of white-crowns seen July 13 on Alder Creek appeared to be very much agitated, and probably had a nest somewhere in the near vicinity. It seemed characteristic of the birds to display the extremest solicitude for the welfare of the young.

One of the most attractive of *Zonotrichia's* habits is that of singing in the twilight. The advent of the season of rest seems to put the birds into the best possible spirits. Perhaps a song is heard close at hand in the thicket. Presently it is answered by another which sounds cheerily from another part of the tangle. As it grows darker there comes a chorus of soft twitterings until finally all is enveloped in the stillness of the desert night.

Spizella passerina arizonae Coues

Western Chipping Sparrow

Distribution.—Observed to 9000 feet altitude; most commonly seen in the mountain mahogany on the west slope of the mountains (6000 to 7000 feet). This accords practically with Ridgway's statement of the habitat of the chipping sparrow as observed by him in the Great Basin (1877, p. 479).

Habits.—The bird's presence in our neighborhood was proclaimed by the trilled call-note which we heard from time to time and which proved very difficult to locate, especially in the sagebrush country. The birds were seen in the limber pines near the summit, in the quaking aspens on the ridges, in the mountain mahogany and in the sagebrush.

A nest was found July 13 on the shore of Alder Creek Lake (7800 feet). The nest contained two young birds and two pipped eggs, and was built near the shore of the lake four feet above the ground. The nest rested on slender twigs on an outer limb on the south side of the bush, being fairly well concealed by upright twigs. Materials used in construction were small sticks and dried grass, the lining being of rootlets and cowhair. The dimensions of the cavity were: diameter 57 mm. (2¼ inches), depth 28 mm. (1⅛ inches).

Seven specimens (nos. 8702–8708) were preserved.

Spizella breweri Cassin

Brewer Sparrow

Distribution.—Practically coincident with that of the sagebrush; apparently limited little by altitude. Observed from 4100 to 9000 feet, and from Winnemucca to Virgin Valley. The great vertical range of this species in a particular sort of environment, regardless even of whether the environment is continuous or not, is another exemplification of the principle adduced by Ridgway (1877, p. 378), and discussed as regards the hummingbird, the flicker, and the Harris woodpecker.

Habits.—*Spizella breweri* was by far the most abundant of the bird species encountered in the region. This accords with

the experience of Ridgway (1877, p. 480), who records it as one of the commonest birds of the open wastes. Throughout the sagebrush country, individuals, pairs, and later, flocks, of Brewer sparrows were observed. Even at high altitudes in the mountains (below 9000 feet, however), as has already been implied, the only seeming requisite for the occurrence of the birds was the presence of *Artemisia*. The thicker the sage the more in evidence was *Spizella breweri*. This is, in our experience, in contrast to a degree with the relation existing between the *sage* sparrow and the sagebrush. The latter bird inhabits the open sage-covered deserts, where vegetation is sparse, although there is apparently variation in this respect in different parts of its range (see the account, p. 397, and Ridgway, 1877, p. 476).

During the latter part of May and the first of June *Spizella breweri* was a most enthusiastic songster, and was heard earlier than 3 o'clock in the morning and later than 8 in the evening. Nor had the tuneful spirit entirely left the bird even by August 10, though its singing was certainly not so much in evidence at that date as earlier in the season.

The birds made rather nervous movements, often flying irregularly into the air to a height of fifteen feet or more and then shooting straight down and coming to rest in a sagebush. Certain variations in flight were observed. For instance, at times a manner of movement resembling that of a vesper sparrow was noted, the Brewer flying in a zigzag manner towards a bush at some distance and sinking to the ground behind it, repeating the operation on being flushed again.

Nests were found by our party at Quinn River Crossing, and at Thousand Creek flats. One found June 4 near a meadow of the Quinn River Ranch contained three eggs and may be regarded as fairly typical. It was well built of light dead twigs, being lined with fine materials, including plant fibers and horsehair. The nest was 685 mm. (27 inches) above the ground, the cavity 50 mm. (2 inches) in diameter and 40 mm. ($1\frac{9}{16}$ inches) deep. Three main branches of the *Artemisia* bush in which the nest was found helped to support it. Another nest (found May 28) was placed on a small branch of sage and supported on the sides by upright twigs which formed a canopy over it. Struc-

turally it was essentially similar to the one just described. Dimensions of cavity were: diameter 55 mm. ($2\frac{3}{16}$ inches), depth 37 mm. ($1\frac{7}{16}$ inches). A nest found on June 2 contained four eggs and was built of weed stems, bits of dry grass, and lined with weed seed, cowhair, and a bit of rabbit fur. Four other nests found varied in height above the ground all the way from 304 to 608 mm. (12 to 24 inches). Of seven nests examined, four contained sets of four, the others sets of three eggs. The first nest was noted May 28 at Quinn River Crossing, the last June 11 on the flats at Thousand Creek.

As a rule the nests were found by the flushing of the sitting bird. Frequently the parent remained close at hand during the investigation of the nest, often with the feathers of the top of the head elevated and the wings drooping, at intervals uttering a weak "chip." On other occasions the bird would fly heavily away, keeping close to the ground. Once at least the disturbed parent disappeared from view entirely and did not utter a note.

About the middle of July the appearance of the scores of young ones became noticeable, and *Spizella breweri* was more than ever in evidence. In certain sage-covered meadows about the head of Big Creek there were hundreds, if not thousands, of the birds. On the broad Leonard and Big Creek flats August 4 they were observed in vast numbers, a large proportion of those seen and collected at this time being birds of the year.

Several flocks were observed in willows along a creek, twit tering together in a most amicable fashion. This peculiarity reminds one of the intermediate and white-crowned sparrows, which, especially in the evening twilight, may be heard singing in a similar manner.

Junco oreganus thurberi Anthony

Sierra Junco

A full-fledged juvenal female Sierra junco was flushed from a small pine in a cañon near the Duffer Peak meadow (8400 feet). It was rather shy and flew into a tall dead pine. The only note it uttered was the low "check! check!" call-note.

A second juvenal was noted taking a bath on the edge of a small lake on the same meadow.

These two individuals were the only representatives of the genus *Junco* seen. As the flight feathers are fully formed in the specimen just mentioned there is, of course, a possibility that the young birds were able to traverse the deserts between the Warner Mountains of California, where the species is common, and the Pine Forest Mountains of Nevada. The distance is approximately eighty-five miles and there are several low desert ranges, reaching a height of 6000 or 7000 feet, interrupting the continuity of the plain between, with intervening flats or hollows which average about 4800 feet altitude. It seems probable that full-grown young birds could have made the trip, and to regard this as a breeding record would seem to be unjustified.

Amphispiza bilineata deserticola Ridgway

Desert Sparrow

Distribution.—Less common than the sage and Brewer sparrows, but still not rare. Noted at Quinn River Crossing, Big Creek Ranch, Alder Creek Ranch, and Virgin Valley. None were observed above 5000 feet. Northern Nevada is, in all probability, about the northern limit of the range of the species.

The birds were more numerous along the foothills in the vicinity of Big Creek Ranch than at any other locality. A single bird was noted in the low brush on a flat-topped and very arid ridge near Alder Creek Ranch.

Habits.—This bird, which was found only in the sagebrush association, resembles the sage and Brewer sparrows in habits. Its *Thryomanes*-like song could be heard at intervals, and as the bird perched on the topmost twig of a bush its black throat rendered it conspicuous for a considerable distance.

Individuals were often difficult of approach, as they would run along the ground until out of firing range, taking advantage of the cover afforded by the sagebrush, and flying twenty or thirty yards ahead when hard pressed.

From the general similarity of the habits of the desert and sage sparrows, it might be expected that competition between them, at least of a subtle sort, would be rather severe. Apparently the interests of individuals conflict in more evident ways, as a desert sparrow was on at least one occasion seen fighting with a sage sparrow.

The song is imperfectly represented by the following syllables, "queet! queet! toodle-oodle-oodle-oodle!" with a rising inflection on the "queets." In a variation of the song a note is apparent resembling somewhat a call of the western lark sparrow.

Two nests were found, the first one containing three eggs, on July 29 in Virgin Valley. After the sitting bird was flushed, it was noted that both parents were present in the vicinity. The bird which had been frightened from the nest was very persistent in returning thereto, but finally left and did not come back.

The second nest was found on a ridge (5000 feet) near Big Creek Ranch. Low "chips" were heard which were finally traced to a desert sparrow which had its beak full of insects and was perching on a rock. Presently the nest was found in a low sagebush by the boulder. The structure was very frail and contained three young in natal down. Dried grass stems and light sage bark constituted the building materials, while a small amount of cowhair and some other fine substance which I was unable to identify made up the lining. The cavity was 44 mm. (1¾ inches) in diameter and 25 mm. (1 inch) deep. Both parents were noted in the vicinity.

Amphispiza nevadensis nevadensis (Ridgway)

Nevada Sage Sparrow

Distribution.—Noted commonly on the broad flats of the desert from Winnemucca to Quinn River Crossing, in much the same habitat as that in which the Brewer sparrow was found. The sage sparrow, however, was not found above an altitude of 6000 feet in the mountains, while *Spizella breweri* ranged to considerably greater elevations along tongues of sagebrush. Ridgway (1877, p. 476) records the species as generally being the most abundant bird in the moister valleys of the Great Basin where the growth is most thrifty. At no locality visited by us did the sage sparrow approach the Brewer sparrow in point of numbers.

Birds of every species were less common in the vicinity of Alder Creek Ranch than at any other point visited, not even excepting the head of Big Creek. No sage sparrows were observed on the western side of the mountains, though the proba-

bilities are that they occur generally over the northern Great Basin. They were noted July 18 at Little High Rock Cañon, Washoe County.

Habits.—One is immediately impressed with the similarity in habits between *Amphispiza nevadensis* and *Spizella breweri*. Both were paired and nesting at the same time, both could often be heard singing simultaneously, both were strict dwellers in the sagebrush association, as noted by Ridgway (1877), and both had similar modes of flight. As regards the latter point, it may be said that the flights of the sage sparrow are longer and more direct than those of the Brewer.

The sage sparrows are lovers of the sparse vegetation of the open desert. Very often their cheery song was the only sound to be heard in such localities. This observation also is somewhat contrary to Ridgway's notes (1877, p. 476), which state the bird's preference for the thicker sage. Although for the most part the birds were paired, individuals and occasionally three or four together in a flock were several times seen. They are very difficult birds to follow, as they take advantage of every sagebush, and usually fly low and run along on the ground. Each time they are flushed they follow a new course, so that one cannot be sure even of their general direction.

They frequently remain quietly on one prominent twig of an *Artemisia* bush, singing at short intervals. One was observed singing as usual, with no noticeable variation in the quality of its song, even though three insects were held in its beak.

Seven nests of this species were found, the first at Winnemucca on May 11, the last June 16 at Big Creek Ranch. Nests were also found at Amos and Quinn River Crossing.

Of the seven nests three contained three eggs each, and the remainder four eggs each. Young in natal down were contained in nests found May 26 and 29 respectively at Quinn River Crossing, and on June 2 at the same locality a nest containing eggs in an advanced stage of incubation was found. The nest found May 26 was in a depression on the ground under a sagebush. The others ranged in height above the ground from 152 to 456 mm. (6 to 18 inches). The finding of the nests so commonly in bushes above the ground is contrary to the experience of Ridg-

way (1877, pp. 477–478) in this regard, who states that the nests are usually on the ground. The structures were variously supported, as a rule being built into the body of the bush so that the foundation was firm, although in some cases the attachment was not so secure. Materials worked into the several nests included dry sage twigs and sticks; in the linings, wool, dried grass, weed stalks, weed seeds, cowhair, and rabbit fur.

In general, discovery of the nest was through the flushing of the sitting bird. Most frequently the bird dropped to the ground and disappeared by running to a distance. One parent hopped along on the ground not far away while the examination of the nest was going on and completely encircled the site. The birds usually made no audible objection, but in one case the parent bird remained fairly close at hand and gave voice to a "pit, pit."

Toward the last of July young in juvenal plumage appeared, one being obtained on the Big Creek flats. All the birds seen above an altitude of 4500 feet were juvenals.

Melospiza melodia montana Henshaw

Montana Song Sparrow

Distribution.—Heard in the willows along the Humboldt River at Winnemucca on May 11. Occurred quite commonly at Quinn River Crossing. Individuals were noted along Big Creek to the altitude of the Dugout Camp, 5000 feet. Observed at Virgin Valley and Soldier Meadows.

Habits.—Song sparrows were very shy, remaining in the willows over the water or on the opposite bank of the river (at Quinn River Crossing), or retreating into very dense thickets (at Big Creek Ranch). Sometimes, however, *Melospiza* approached the field naturalist very closely and looked him over.

They had apparently mated by May 21. Nests were found at Quinn River Crossing, Big Creek Ranch, and Virgin Valley. The first, containing one fresh egg, was noted May 31 at the first mentioned locality. It was 203 mm. (8 inches) above the ground in grass growing up between small willow branches, and was composed of dried marsh grass and weed stalks, and lined with fine grasses and horsehair. The diameter of the cavity was 57 mm. (2¼ inches) and its depth 47 mm. (1$^{13}/_{16}$ inches).

On June 2 a nest was discovered in a clump of willows near Virgin Creek. It was close to the ground and contained three young birds. Both parents were noted in the vicinity. On June 15 a third nest was found at Big Creek Ranch. This one was noteworthy for the fact that it contained a cowbird's egg besides two fresh eggs of its rightful owner. The eggs were cold and the nest had probably been deserted. It was located 253 mm. (10 inches) above the ground in a willow-clump. Stalks of some species of grass growing at the base of the willow were woven into the nest. The cavity was 54 mm. (2⅛ inches) in diameter by 49 mm. (1^{15}⁄$_{16}$ inches) deep.

Juvenals were observed on May 29 and thereafter. A female with bare breast and an egg in the oviduct was collected on June 11.

Passerella iliaca schistacea Baird

Slate-colored Fox Sparrow

Distribution.—A solitary specimen taken at Quinn River Crossing on May 18. Rather commonly observed in the early summer at Big Creek Ranch, and one of the more numerous birds of the higher parts of the mountains. Their habitat was typically Transition life zone.

Habits.—The birds were noted to 9000 feet altitude, one being heard singing from a perch on a quaking aspen above a snow-bank. The species was perhaps more common on the west slope of the main ridge of the mountains around and above Alder Creek Lake and southward from there toward Duffer Peak than at any other locality visited. The rocky slopes, covered with chinquapin and quaking-aspen thickets, with a sparse intersprinkling of mountain mahogany and limber pine, seemed to be particularly well liked by the fox sparrows.

When a squeaking sound was made with the lips any *Passerella* that happened to be within hearing emerged from his thicket and, "chipping" excitedly, looked the intruder over.

It is one of the most tuneful of all the birds of the Great Basin and, furthermore, its song is one of the most beautiful. One fox sparrow was observed singing from an aspen tree in which, at the same time, a couple of black-headed grosbeaks were also singing.

Vegetation about springs on the mountain meadows was almost sure to shelter several individuals of this species in company very often with white-crowned sparrows and Macgillivray warblers.

Fox sparrows feed principally on insects and their larvae which they find in the leaf-mold under willow and aspen thickets. One individual was watched as it worked for its noon meal in the loose matter at the base of a clump of willows. It scratched in a towhee-like manner, using both feet at the same time. It would dig for several seconds in one place, often without reward. The amount of endeavor and labor that had to be bestowed on the task was impressive.

On June 26 a fox sparrow was observed whose vitality was so low that it could scarcely hop along or scratch in the leaves. Upon being closely examined it was found to be in a very emaciated condition and probably diseased.

The birds were in full song from May 18 to the last of June. The willow tract below Big Creek Ranch was a favorite place of habitation, and the actions of individuals observed during the second and third weeks in June would indicate that they were nesting there, but no nests were discovered. Most of the males had testes enlarged. A female with a bare and calloused breast was secured on June 12, which would indicate that the eggs had been laid by that date. Six days later another female which had evidently been sitting or brooding was noted in Big Creek Cañon at an altitude of 4800 feet. Birds were observed in about the same places day after day, which may have indicated nests in the vicinity. Juvenals were first observed about the middle of July. Thereafter they were common.

Pipilo maculatus curtatus Grinnell

Nevada Towhee

A very few individuals of this species (see Grinnell, 1911, p. 309) were noted along Big Creek above the ranch below 5600 feet. One was heard singing June 16 on the swaying tip of a willow. Its song did not sound exactly like that of *P. m. megalonyx* of southern California. Ridgway (1877, p. 493) has very clearly described the pose and movements of the singing bird.

A second towhee was heard June 22 in the sage near the mouth of the cañon. Five days later two individuals were heard in the willows at an altitude of 5600 feet. Both were uttering their trilled "tschschschschsch!" call-note. The testes of a male specimen secured were enlarged, indicating sexual activity.

No reason for the restricted distribution of the towhee is apparent, since other cañons visited would seem to present environmental conditions almost identical as regards exposure, altitude, stream, foliage, and food supply.

Three examples (nos. 9151–9153) were secured.

Oreospiza chlorura (Audubon)

Green-tailed Towhee

Distribution.—Occurred rather commonly in the mountains between 4350 and 9000 feet altitude. Most numerous on open hillsides from 5000 to 7000 feet, decreasing in numbers above or below the tract between these altitudes. It was found characteristically in the Transition, though individuals invaded Upper Sonoran.

Habits.—The great majority of green-tailed towhees were noted in sagebrush. On the higher slopes they dwelt to a slight extent in chinquapin and quaking-aspen thickets. Frequently individuals were observed with beaks full of insects. The birds were in full song during the last week in June and the first two weeks in July. While singing they ordinarily perched on the topmost twig of some convenient sagebush, or on the upper pinnacle of some large boulder. Their song is much like that of the fox sparrow, although it is not so round and full-voiced. It seemed to me to be much more like that of the fox sparrow than that of the vesper or lark sparrows. Ridgway (1877, p. 497) speaks of its close resemblance to that of the vesper in style, tone, and modulation, and to the song of the lark sparrow in its quality of continuity.

One of the call-notes resembles the "mew" of a cat to a considerable extent. By making a squeaking sound with the lips, I induced one towhee to answer me several times with this feline call. Unusual sounds, such as that just mentioned, usually

attracted the bird into the open. A second note is a low "chip" or "chick," uttered when the bird is excited over something. The birds make use of it to very good purpose, moving about continually and thus giving it something of the so-called ventriloquial quality of the call-notes of the long-tailed chat.

Two modes of retreat were observed. At times when flushed the towhee will fly for some distance, then sink down into or behind a bush, repeating the operation before a person can get very close to it. Escape is also made by running along on the ground with long green tail high in the air, and finally disappearing into a suitable thicket.

Although we were able to accumulate abundant circumstantial evidence upon the nesting of the towhee, no nests were actually discovered. On June 23 a bird was flushed as if from a nest, but if there was one we failed to find it. The agitated deportment of a pair of towhees on June 27, on a meadow on Big Creek, probably indicated their nesting in the vicinity. The first day of July, as I was working through some brush just above a high meadow, a green-tail came running out toward me from a chinquapin thicket. She ran along on the ground dragging her wings as if hurt, heightening the effect of the pretended deception by uttering a shrill note of pain. She limped and ran off to a distance of ten feet. The cause of her solicitude was found to be a youngster in newly acquired juvenal plumage. From this time on immatures were commonly observed.

On July 13 a young towhee was found dead on the waters of Alder Creek Lake.

Zamelodia melanocephala (Swainson)

Black-headed Grosbeak

Noted at Quinn River Crossing, Big Creek Ranch, Big Creek Cañon, Duffer Peak, and Alder Creek. Although they were fairly common at the stations on the desert, very few grosbeaks were seen in the mountains. Found chiefly in Upper Sonoran, although individuals ranged into Transition.

Grosbeaks were observed along Quinn River and Wheeler Creek. They were frequently seen at Big Creek Ranch, being observed along the stream and in the willow thickets. By June

1 the species was in full song. In Big Creek Cañon a grosbeak and fox sparrow were heard singing simultaneously in the same tree.

The first individual was seen at the head of Big Creek (8000 feet) on July 1. Ridgway (1877, p. 488) did not find the species ranging to this altitude. A couple of days later one was heard singing in an aspen, and after this a few grosbeaks were ordinarily to be found in the higher parts of the mountains. Probably a partial vertical migration took place about this time, as the weather was becoming much warmer.

A youngster begging for food was seen at Big Creek Ranch on July 27.

Passerina amoena (Say)

Lazuli Bunting

Occurred generally along the route followed by the expedition, from Quinn River Crossing to Alder and Leonard Creek ranches, and to a height of 8000 feet in the mountains. Found characteristically in Upper Sonoran and lower Transition zones.

The lazuli bunting was a bird of the mountain stream association of plants, being observed in quaking aspens, wild rose and gooseberry thickets, willows, and in alders.

In certain localities they became very numerous. On July 7, at an altitude of 6000 feet on Big Creek, twenty or more individuals were observed. In general the buntings were most common from 5000 to 7000 feet altitude.

At Quinn River Crossing lazuli buntings were observed both in the sagebrush of the desert and in the willows along the river. In no case were they seen far from streams. After June 1 the birds were in full song. One brightly plumaged male observed was shyer and more secretive than its more modestly clothed mate, which is, in my experience, contrary to all precedent. Upon my appearance the male dodged back into a thicket, though the female remained in plain view.

Males were commonly observed along streams, perching for a few moments on some topmost swaying willow branch. After voicing a roundelay of song, a flight would be made down stream for some distance, and the vocal performance would be repeated. Sometimes they sing while flying through the air.

The birds were shy at all times.

On July 17 two flocks of young birds were noted. The parents seemed very solicitous for the welfare of their offspring.

Passer domesticus (Linnaeus)

English Sparrow

A few noted May 11 about houses in Winnemucca. No specimens were collected.

Piranga ludoviciana (Wilson)

Western Tanager

Occurred rather sparingly along our route. Those observed were very shy. The first individual was seen between Amos and Tregaskis Well, where it was frightened from the sagebrush. They were noted at nearly all the camps, though in very limited numbers. The birds may have been breeding in Transition.

Specimens taken, four (nos. 9154–9156, 9231).

Petrochelidon lunifrons lunifrons (Say)

Cliff Swallow

Distribution.—Observed at localities below 5000 feet altitude in the Upper Sonoran zone.

Habits.—It was the usual thing to see cliff swallows circling about the eaves of ranch buildings. They were more abundant at Quinn River Crossing than at any other point visited. On May 16 about 50 were seen flying about over our camp. The birds seldom alight on any sort of perch except in their nests, but individuals were twice observed resting upon the ground. They remained for no more than thirty seconds. Four individuals were noted at the mouth of Wheeler Creek, several miles from Quinn River Ranch.

The last of May the birds commenced building nests at the Crossing, for the most part on the east sides of the barns. Some were nesting in low cliffs not far from the river. At Big Creek Ranch the season seemed to be somewhat later, and the birds were seen gathering mud the middle of June. On June 21 the foundation of a nest had been built on the south side of the

barn at that place. Here they entered the open carriage house, and had built nests on the cross-beams of the same, the nests being placed in a way which is rather unusual for cliff swallows, namely, on the upper surface of the beams.

Cliff swallows were nesting in numbers in the sides of Virgin Creek gorge through the wall of Virgin Valley.

Hirundo erythrogastra Boddaert

American Barn Swallow

Distribution.—Observed at Tregaskis Well, Quinn River Crossing, Big Creek Ranch, and Alder Creek Ranch.

Habits.—Barn swallows were not so common as the cliff swallows, but small numbers were ordinarily to be seen flying about the ranch houses. Ridgway (1877, p. 441) remarks their lesser numbers as compared with the cliff swallows, and notes that they inhabit similar situations.

They seem very solicitous for the welfare of their mates. If anything happens to one, the other circles about in an agitated manner and does not leave the vicinity for some time.

In our experience these birds alight more often than do the cliff swallows. The latter are very seldom seen at rest, except at the openings of their nests, but the barn swallows are often observed perching on fence wires.

The swallows have several call-notes; one is a kind of whistle, another a continuous twittering. When one approaches the nesting sites the birds fly about very excitedly, giving voice to a note which may be transcribed as a "tweet! tweet! tweet!" somewhat resembling the note of the spotted sandpiper.

On May 31 barn swallows were found nesting at Quinn River Crossing both on Mr. Payne's residence and under a bridge. At Big Creek Ranch June 14 three were observed possibly going through copulatory antics. Two individuals would come together in air from time to time and fall about a foot before separating or recovering themselves. Toward the last of July, at Big Creek Ranch, young birds were out and imperiously demanding food, uttering a note somewhat resembling a call-note of the Audubon warbler.

Iridoprocne bicolor (Vieillot)

Tree Swallow

A single example (no. 9183) obtained at Quinn River Crossing on May 20.

Tachycineta thalassina lepida Mearns

Northern Violet-green Swallow

A few of these interesting birds were seen at Quinn River Crossing on May 28. No more were observed until a month later, when four or five individuals were noted flying about the higher parts of the mountains. Observed in Virgin Valley flying about over a pool of water, catching insects. From the observed facts, first, of their remaining all through the summer, and second, of their deportment of themselves in pairs, we were led to believe that they were breeding at the greater altitudes.

Three specimens were secured (nos. 9179, 9180, 9298), at Quinn River Crossing (4100 feet), Duffer Peak (8500 feet), and Virgin Valley (5000 feet), respectively.

Stelgidopteryx serripennis (Audubon)

Rough-winged Swallow

Six individuals were seen June 2 at Quinn River Crossing (4100 feet) flying about over the mesa near Wheeler Creek. On July 17 two were observed perching on a bush on Alder Creek, a short distance above the ranch (5000 feet). Two individuals were noted flying about a field at Leonard Creek Ranch (5000 feet) on August 7.

Two specimens (nos. 9181, 9182) were taken.

Lanius ludovicianus excubitorides Swainson

White-rumped Shrike

Distribution.—Occurred rather commonly on the broad sagebrush flats and to an altitude of 6500 feet in the mountains. A single individual was noted on a sage-covered hillside at 8000 feet. Three individuals were observed in the low hills east of

the broad Leonard Creek flats, north of Sentinel Peak, and the same number were seen at Leonard Creek Ranch. The last mentioned birds were extremely shy.

The shrike did not range much above the Upper Sonoran zone.

Habits.—Shrikes had evidently mated by the middle of May, and their peculiar mechanical notes were not infrequently heard.

Two nests were found, May 18 and 26 respectively, both at Quinn River Crossing. The sites selected by the birds were conspicuous bushes relatively much larger and more prominent than the surrounding sagebrush. The nests themselves were firmly and symmetrically constructed. Both were very solidly supported by a number of live branches and built of coarse sticks. The thorny branches of the *Sarcobatus* bush had been used in the second. Fine dry bark, cowhair, horsehair, sage leaves, fine gray twigs, rabbit fur, and a bird's feather were materials which had been made use of for nest-lining purposes. The proportions of these varied, the rabbit fur being very small in amount, and the bird feather and horsehair being limited to a single specimen of each found in one nest. The first nest was 1.01 meters (40 inches) above the ground, the second .608 meter (24 inches). Nest-cavity dimensions in both cases were 88 mm. (3½ inches) across by 76 mm. (3 inches) deep.

Individuals were frequently seen near Big Creek Ranch on the lower ridges of the mountains, where they perched on sagebushes or boulders.

A family of adults and young was twice observed during the first half of July in the neighborhood of the Dugout Camp in Big Creek Cañon. On July 17 a family of four was met with near a haystack at Alder Creek Ranch.

Vireosylva gilva swainsoni (Baird)

Western Warbling Vireo

Distribution.—Noted in the mountains, where it was found in small numbers along the streams; at Big Creek Ranch (4350 feet, Big Creek Cañon (4400 to 8000 feet), Duffer Peak Meadow (8400 feet), Alder Creek (6000 to 7000 feet), and Leonard Creek (6500 feet). The birds were noted in the greatest numbers at

an altitude of 7000 feet on Big Creek.

Habits.—All that is necessary, as a rule, to attract the vireos is to remain motionless and make an unusual squeaking sound with the lips. One bird was observed with a large insect in its mouth. On July 15, at 6000 feet altitude on Alder Creek, a couple of young ones were heard teasing a parent for food, so there is very little doubt of the breeding of the species in this region.

Vermivora celata orestera Oberholser

Oberholser Lutescent Warbler

Distribution.—Observed at several localities in the higher portions of the mountains; head of Big Creek (8000 feet), Alder Creek (7000 feet), and Duffer Peak Meadow (8400 feet). Evidently the lutescent warbler was limited to Transition. It was nowhere seen in numbers.

Habits.—The large patches of low, tangled quaking aspens on the higher slopes of the mountains seemed to be the favorite habitat of the lutescent. In the course of the summer's work we *saw* very few indeed, but occasionally heard the characteristic trilled call-note. This song made itself most evident in the morning, but once, at least, it was noted in the early afternoon.

Ordinarily the birds are very shy and their movements difficult to follow. In the gnarled aspen thickets they kept well within the shelter of the tangle, or where the trees were higher they remained in their topmost leafy foliage. In either case they were hard to locate. Two individuals observed perched on dead limbs of limber pines. The bird at times exhibits an extreme nervousness of movement, while at others it remains quietly perched on a single twig for several minutes.

A number of juvenals were seen in company with some chickadees in a willow patch near Duffer Peak. The greater shyness of the warbler was immediately apparent.

Dendroica aestiva brewsteri Grinnell

California Yellow Warbler

Distribution.—Noted at practically all stations below 6500 feet altitude. A single juvenal was taken at the Duffer Peak

Meadow (8400 feet). Breeding in Upper Sonoran and possibly higher.

Habits.—Yellow warblers are not confined exclusively to the willow thickets, and although they do not venture far from water they often do make short excursions into the sagebrush.

The species has at least two call-notes. One is very close to the "chick" of the chipmunk, while the other, while it may be transcribed by the same syllable, is much weaker. One female uttered this second call-note and shortly afterward a male bird with wings and tail spread came dashing into the tree. He went away in a short time, but upon a second call returned.

On June 11 a bird was seen collecting willow cotton. The first nest was found on June 5 in a wild rose at Quinn River Crossing. Willow bark was the main constituent of the nest, the lining being of plant down, feathers and horsehair. A single willow catkin had also been worked into it. The cavity was 42 mm. ($1\frac{11}{16}$ inches) in diameter and 38 mm. ($1\frac{9}{16}$ inches) deep. The set of four eggs was complete.

Another nest was discovered on June 16 at Big Creek Ranch. It was located six feet above an irrigating ditch also in a wild-rose bush. The cavity was 44 mm. ($1\frac{3}{4}$ inches) in diameter and nearly 50 mm. (2 inches) deep. Three eggs, incubation about half completed, constituted the set.

Males were twice observed feeding their mates. The female followed the male bird and shook her wings, assuming a begging attitude which was quite linnet-like in character, while the male bird fed her two or three times. During this process the birds, or perhaps only the female, gave utterance to a decidedly chipmunk-like (*Eutamias pictus*) series of chatterings. Both these birds were fully adult. Perhaps the female does not take time to hunt food during the brooding period.

A nest in process of construction was noted the same day a few hundred feet farther down the thicket. It was saddled on a wild-rose crotch, three feet above the ground. Shreds of willow-bark were the most prominent building materials employed, these being fastened together with spider web.

Dendroica coronata hooveri McGregor

Alaska Myrtle Warbler

A single individual secured at Quinn River Crossing on May 21. It was flying about in the brush near the junction of Wheeler Creek and the river. The discovery of the species migrating at this late date is unusual.

Dendroica auduboni auduboni (J. K. Townsend)

Audubon Warbler

Distribution.—Noted at nearly every desert station visited. During June it retired to the pine woods of the mountains, for at that time, though we found it occurring commonly at higher localities, it was apparently absent from stations intermediate in altitude. This vertical migration was observed by Ridgway (1877, p. 434), who asserts that its migratory movements in this region are mainly, if not entirely of this character. The species was breeding in Transition.

Habits.—The song of the Audubon warbler was much in evidence during July. A brilliantly plumaged male, observed in a thicket of tall sagebrush continually uttered a note resembling "pick!" "pick!" The syllable differed markedly from the customary "tit" or "wit" of the species.

Another individual was observed singing from one of the uppermost twigs of a limber pine. Its head was tilted backward during the song. After the rendition it would feed in the foliage of the pine or fly a short distance to another tree, shortly repeating its song again.

Adults with juvenals were sparingly noted as early as July 10, and thereafter more commonly. By August they became abundant.

For discussion of a probable case of hybridization between *Dendroica auduboni auduboni* and *Dendroica coronata* see Taylor 1910b. p. 173.

Oporornis tolmiei (J. K. Townsend)

MacGillivray Warbler

Distribution.—Occurred quite generally in suitable situations. Noted from Upper Sonoran at 4100 feet altitude to Transition at 8500 feet. It was doubtless breeding in Transition.

Habits.—A squeaking sound made by the lips was often sufficient to coax *Oporornis* from his favorite foraging grounds, the willow thickets and chinquapin patches (*Castanopsis*). One could often trace an individual by attending closely to the little call-note "chick!" "chick!", the only difficulty being that frequently the intervals between its times of utterance became long drawn out. The song of the MacGillivray warbler resembles those of the yellow warbler and lazuli bunting, but is nearer that of the latter, though it has a lighter, airier quality. One individual was seen with a large worm in its mandibles.

On the morning of July 9 two pairs were observed in the rank undergrowth over some springs surrounded by a thick grove of quaking aspens at 7000 feet altitude on Big Creek. One pair became highly excited, the female especially. Both birds approached to within a few feet of the collector. Though these signs indicated a nest in the vicinity, none was discovered. A juvenal was secured on July 15.

Geothlypis trichas occidentalis Brewster

Western Yellowthroat

Not common anywhere. A few individuals were noted at Quinn River Crossing, Big Creek Ranch, and Virgin Valley. Zonally the species was found in Upper Sonoran.

While ordinarily the yellowthroat was exceedingly suspicious, one was sometimes able, by making a peculiar sound with the lips, to coax the bird from its hiding place into plain view.

Eleven examples of the species (nos. 8509–8518, and 9205) were preserved.

Icteria virens longicauda Lawrence

Long-tailed Chat

Heard at Quinn River Crossing, Big Creek Ranch, and at 6000 feet altitude in Big Creek Cañon. Not common.

The chat was shy and secretive at all times, being for the most part merely heard in the willow and alder thickets along the streams. One of its many notes may be transcribed as "tä-tä-tä-tä," repeated rapidly, somewhat resembling a note of the Arizona hooded oriole. Two individuals (nos. 9187, 9188) were preserved.

Wilsonia pusilla pileolata (Pallas)

Pileolated Warbler

One of the rarer species. Recorded from two localities only, Quinn River Crossing (along Wheeler Creek and at the Crossing) and Big Creek Ranch. Found in Upper Sonoran zone.

Two pileolated warblers were seen at the first-named place May 26. A few days later one was heard singing near Wheeler Creek early in the morning.

The birds were not in the least shy, and often came very close to the observer. Three specimens taken (nos. 8507, 8508, 9297).

Cinclus mexicanus unicolor Bonaparte

Northern Dipper

Rare, only six or eight birds being seen all season. One was observed in Alder Creek Lake (7800 feet), where it was dwelling under a waterfall which occurred in a stream connecting two parts of the lake. The dipper was found in Transition zone.

Water ouzel sign, in the shape of the characteristic white splotches of fecal matter on rocks in the stream, was observed on a meadow located at an altitude of 8000 feet on Big Creek.

Two juvenals (nos. 9149, 9150) were secured on Leonard Creek.

Oreoscoptes montanus (J. K. Townsend)

Sage Thrasher

Distribution.—One of the commonest and most widely distributed species of the region. Localities at which the birds were

noted include all but those above 8500 feet altitude. Found commonly in the sagebrush association of Upper Sonoran and Transition zones.

The ranges of *Oreoscoptes montanus* and *Artemisia tridentata* were practically coextensive. Where one thrives, there the other apparently has its center of abundance. Thus, though the sage thrasher was found in numbers on the desert about Quinn River Crossing, it was most abundant in the flats of Leonard Creek where the sagebrush was flourishing.

Habits.—The monotony of the desert quiet was often most happily interrupted by the singing of this "mockingbird" of the arid valley. The song is somewhat imitative, perhaps, as we seemed to be able to recognize notes similar to those of the meadowlark and of the black-headed grosbeak in it.

Sage thrashers were rather frequently seen on a series of sage-flats, ranging up to 8000 feet and above, near the head of Leonard Creek. To a considerable extent the birds resemble the true mockingbird (*Mimus polyglottos leucopterus*) as regards habits of movement and song. When running along on the ground the tail is held in much the same manner, and we noted that they preferred running along on the ground to flying. The pose while singing, and the manner of flight, also remind one of the mockingbird. The differences between *Oreoscoptes* and *Mimus* seem to have impressed Ridgway (1877, pp. 400, 401) to a greater degree than the resemblances. It is true that in its habits it clearly shows thrasher affinities, and this, together with the fact of its being sage-loving, makes sage thrasher by far the most appropriate vernacular name.

An individual of one pair which was observed on a high sage-flat in the mountains lifted its wings at intervals while singing, as Ridgway (1877, p. 400) has noted. These birds were seen at an altitude of 8500 feet in a narrow depression along the side of which was a snowbank. It seems remarkable that this bird, ordinarily associated with wide expanses of desert, should be found on a level with the summer snow in the mountains.

The birds were often observed perching on rocks, in localities where boulders furnished one of the principal features of the landscape.

To a certain extent the sage thrashers were interested in each other. When one of a company was shot, the others frequently gave utterance to various expressions of excitement.

According to our own observations and to those of Ridgway (1877, p. 401) the sage thrasher exhibits a very quiet disposition during the period of incubation. There possibly is sufficient variation in the time of nesting to account for the fact that some are singing while others are silent. At all events there are numerous individual exceptions to the general statement. Ridgway has added that the males become perfectly silent the last of April.

The birds were evidently breeding in some numbers at Quinn River Crossing during the latter part of May and the first of June. A half-dozen nests were found, of which descriptions are given below. The sitting bird's sudden bursting from the nest most often led to its discovery. Our observations on method of flight confirm those of Ridgway (1877, p. 400). One bird retreated in a vesper sparrow-like manner, flying low over the sagebrush and suddenly dropping down either into brush or onto the ground. Ordinarily if one is traversing sage-tracts several of the birds are to be seen perched upon exposed twigs.

The first nest, found May 17, was located in the middle of a sagebush, being supported mainly by the largest stem, and partly by four other branches. The second, found the same day, was similarly located. Both nests were very carefully built, but neither was especially well concealed. Measurements: the first, two feet above the ground 95 mm. (3¾ inches) across the cavity, and 57 mm. (2¼ inches) deep; the second, twenty-two inches from the surface, 95 mm. (3¾ inches) in diameter, and 50 mm. (2 inches) deep. Coarse sticks constituted the foundation work of both nests. The layer next within was of soft dry bark, the innermost lining being of cowhair. In both instances four eggs constituted the set. A somewhat deeper nest was found the next day, twenty-two inches above the ground, the nest cavity 76 mm. (3 inches) in diameter and 76 mm. (3 inches) deep. A slight movement of the twigs of the bush and a barely perceptible fluttering sound as the bird forsook the nest betrayed its presence. The fourth was discovered on June 6 near Quinn River

in a very thick thorny bush. Unlike the others it was very well concealed, and it was some moments after the bird flushed before the nest was discovered. It held two eggs, evidently not a full set. In every respect excepting degree of concealment this nest closely resembled the others noted. The last one found was observed between Quinn River Crossing and Big Creek Ranch, about two miles from the latter locality. The parent flushed from a low thorny bush. The nest was one foot above the ground and contained the usual set of four eggs.

One of the birds frightened from a nest proved to be a male, indicating that the male takes part in incubation.

Great numbers of juvenals were seen the first few days of August about the Leonard Creek flats. Growing in a small cañon draining into Big Creek there was noted a considerable tract of gooseberry brush. Hundreds of sage thrashers, in company with large numbers of Brewer sparrows, green-tailed towhees, and fox sparrows, were feeding on the berries.

Salpinctes obsoletus obsoletus (Say)

Common Rock Wren

By far the commonest of the Troglodytidae in the uplands. Zonally it ranges from upper Sonoran to high Transition (see Grinnell, 1908, p. 118).

Habits.—This was one of the most characteristic birds of the rocky portions of the mountain range. It was observed also on the buttes near Quinn River Crossing. While the rock-piles constituted the preferred habitat, a few birds were observed on limber pines in the higher mountains, and at Virgin Valley a single individual was observed on the desert near a marsh. On July 29 two rock wrens were seen in a series of jutting rocks on the highest point of Duffer Peak.

Their song much resembles that of the mockingbird, being one of peculiar sweetness and variety, although it is not powerful. When in full song their melody is continued through the middle of the day.

While resetting a mouse-trap at Big Creek Ranch near a pile of boulders I heard a ringing call-note and presently on a rock immediately above me a trim little fellow appeared not six feet

distant. After regarding me for a minute or two he flew across the cañon. Ordinarily the birds are easily approachable.

The rock wren evidently possesses something at least akin to personal courage. One was observed attacking a chipmunk which was sitting on a rock, swooping at it in the same way that a mockingbird assaults a cat.

After July 8 young were quite commonly seen. While we were putting out a line of traps on a meadow on Big Creek (7000 feet) a family including two juvenals with the adults was met with. The youngsters had not been long out of the nest, as their "juvenal" plumage was still incomplete. As we approached, the excitement of the parents knew no bounds, one of them, supposedly the female, venturing to within four feet of us, and calling solicitously. Even in her excitement she caught and ate some small insect, deftly wiping her bill afterwards on the rocks. This may signify that the capture of food is largely a reflex action. It should perhaps be noted that the presence of food in the mouth does not interfere with the quality of the song to any appreciable extent; one male was heard singing roundly with his beak full of insects. This seems to be the case also in certain other birds, as for instance, the song sparrow and Cassin purple finch. Three or four young birds in each family were in most cases the numbers seen.

Troglodytes aëdon parkmani Audubon

Western House Wren

Recorded only from stations located in Transition zone, between 6000 and 8000 feet in the mountains. Young were twice observed, indicating that the birds breed in the region. One wren was caught in a mouse-trap set ten feet from the stream. A large family, including adults and juvenals, was observed July 28 on a flat covered with thick sagebrush at an altitude of 6000 feet on Big Creek.

Telmatodytes palustris plesius (Oberholser)

Western Marsh Wren

Two wrens of this species observed on May 20 in a tangle of wild rose and scrub willow on the banks of Quinn River. One of these (no. 8482) was secured.

Sitta canadensis Linnaeus

Red-breasted Nuthatch

Occurred rather rarely in the region. The first was noted on a barbed wire fence near Quinn River Crossing on May 24. First it flew to a post, down which it worked in a typical nuthatch fashion. Then it flew to the sagebrush, and perched, sometimes with head up, sometimes with head down. It caught and ate some sort of insect, and was not shy. It certainly gave one a feeling of surprise to find this bird, which is ordinarily so characteristic of the coniferous forest of the Boreal zone, in the midst of an arid waste far from trees of any kind. Our notes on habits bear out those of Ridgway (1877, p. 416), who states that apparently this species makes more or less of a vertical migration. We found the bird in Upper Sonoran and Transition.

Two nuthatches were seen on Wheeler Creek, one bird in the sagebrush and the other in the willows along the stream. Two were seen at Big Creek Ranch, both in the trees near the creek. Three other individuals were observed in limber pines at higher points in the mountains. The last specimen taken (no. 8969), secured on July 4, had its plumage much abraded. One of the call-notes of the nuthatch may be rendered "whă! whă! whă!" Five specimens (nos. 8965–8969) were preserved.

Penthestes gambeli gambeli (Ridgway)

Mountain Chickadee

Work was carried on in the limber pine area of the higher portions of the mountains for some time before *Penthestes* was recorded. The first one noted was seen near the shores of Alder Creek Lake (7800 feet). The species was confined to that portion of the Transition having a Boreal infusion.

The numbers of such pinicoline birds as chickadees, nuthatches and juncos were far smaller than one would expect, even considering the extremely limited pine-covered area.

Most of the chickadees noted were heard July 11 to August 1 in the vicinity of Duffer Peak.

On July 30 and August 1, respectively, two broods of juvenal

chickadees were observed, nine in one, seven approximately in the other. They appeared either in the limber pines or in the quaking aspens, though they seemed to prefer the pines.

The song which may be rendered by the syllables "wheetle! tootle! tŭh!" "wheetle! tootle! tŭh!" was the one most frequently heard.

Psaltriparus plumbeus (Baird)

Lead-colored Bush-tit

Distribution.—Not common anywhere along the route. Two individuals were seen May 26 in the sagebrush at the mouth of the low wide Wheeler Creek Cañon. At Quinn River Crossing a small company was seen in the sagebrush on June 2. In the vicinity of Big Creek Ranch they were confined, apparently, to a rather restricted portion of the course of the stream, namely, from about 4400 feet to 5000 feet altitude, their range here being practically coextensive with that of the spurred towhee. Later in the season a few flocks of from six to twenty-five individuals each were observed higher in the mountains, e.g., fifteen were seen on the Duffer Peak Meadow (8400 feet), in a grove of quaking aspens. Zonally their distribution was lower Transition, perhaps invading Upper Sonoran at times.

Habits.—The solicitude and as a rule the unsuspicious nature of the bush-tits were very marked. If anything happened to one individual, the others remained in the vicinity, twittering and whistling to one another. A number of young birds were secured, the first being taken at Quinn River Crossing on June 2.

Some of the bush-tits noted were shy. Their call-notes seemed to differ slightly from those of *Psaltriparus minimus californicus.*

In the lower parts of the mountains they evinced a preference for the thickets along the streams, taking to the sage if pressed closely. Upon the higher mountain slopes the quaking aspens were preferred.

Regulus calendula calendula (Linnaeus)

Ruby-crowned Kinglet

Conspicuously absent from the mountains. On May 13 one was seen in a willow on Chimney Creek near Amos post-office.

Water from a recent dip in the stream was still clinging to its feathers. Another individual was heard several hundred yards up the creek. Two birds, evidently a pair, were seen May 18 at Quinn River Crossing in the sagebrush near the ranch. This species was evidently migrating, being found by us only in Upper Sonoran zone. Two female specimens (nos. 8662, 8663) were taken.

Hylocichla ustulata swainsoni (Tschudi)

Olive-backed Thrush

Distribution.—Noted along Big and Alder creeks between the altitudes of 5700 and 8500 feet. Its habitat falls within that part of Transition which has a Boreal infusion.

Habits.—The song of this bird, which was perhaps the most attractive esthetically of all the bird-music we heard, was first noted at the head of Big Creek. Regularly while we were encamped in the mountains it was noted early in the morning and in the evening until eight o'clock. The limber pines, quaking aspens, and various thickets along streams seemed to be favorite places of habitation. One locality in particular, situated at a height of 7000 feet on Big Creek, was preferred to other places. A thick growth of moisture-loving plants, such as nettles, and the dense shelter afforded by the extensive quaking-aspen groves, together with the presence of streams flowing from small springs on the nearby slopes, made ideal surroundings for this thrush.

Three young thrushes in newly acquired juvenal plumage were recorded on Alder Creek (7000 feet) on July 13.

Planesticus migratorius propinquus (Ridgway)

Western Robin

Distribution.—Secured generally throughout the region. One of the most numerous birds observed. In scarcely diminishing numbers it invaded the mountains to an altitude of 9000 feet. Below this it was very common. It inhabited every suitable stream and willow clump on the desert. Its zonal distribution was Upper Sonoran and Transition.

Habits.—One robin was seen scratching about like a fox sparrow in the leaves near a log. In the higher parts of the mountains robins perched as freely on rocks and boulders as on pines and aspens. The species exhibits marked adaptability and considerable independence of temperature limitations.

Nearly all our habit notes have to do with nidification, as practically every bird observed from May to August was caring for eggs or young, or was singing. Robins were nesting May 11 in the poplars along the streets of Winnemucca. Nests were noted in the sagebrush on Chimney Creek near Amos, and at every locality from the willows along the Quinn River (4100 feet) to the limber pines (9000 feet) of the Pine Forest Mountains. Nesting materials included dry straws of wild hay and straw peelings, sticks, grass, bark and leaves. In every case the nests were cemented together with mud. Dimensions of nest cavity varied about the following figures, namely, diameter 98 mm. (3⅞ inches), depth 71 mm. (2 13/16 inches). Nests were found on the ground and at various heights up to six feet above it, and were located in willow thickets, wild-rose bushes, sagebrush, quaking aspens, poplars (at Big Creek Ranch) and limber pines. The nests contained two to four eggs, with the exception of one found June 20, in which were two youngsters in natal down. Dates of finding of nests, significant in a general way, are May 11 to June 29. The parent birds always became much excited upon the examination of their homes, and remained close at hand, often coming up to within a few feet of the intruder. In every case but one, in which the bird betrayed its agitation by excited action merely, the birds gave utterance to many querulous call-notes.

The first juvenal was observed on June 14 at Big Creek Ranch. From then on young were very common.

Sialia currucoides (Bechstein)

Mountain Bluebird

Distribution.—Noted only above 6700 feet, in Transition.

Habits.—Small flocks of four or more birds were frequently observed perching motionless on convenient rocks on some hill-

slope. As the field naturalist approached, one individual would leave, and soon the impulse would communicate itself to its companions, when all would fly for some distance. In general the birds were rather shy.

Toward the last of July the birds were seen for the most part in companies of two or three, although an occasional lone individual was noted.

A female taken on July 25 had the bare breast indicative of brooding. Furthermore, when secured this individual had its beak full of insects, which it may have been carrying to young.

On July 13 a juvenal was found dead in Alder Creek Lake. A number of young were seen in the higher parts of the mountains between that time and August 8.

Transmitted June 8, 1911.

LITERATURE CITED

American Ornithologists' Union Committee, J. A. Allen, Chairman and Editor.

1910. Check-list of North American birds. Ed. 3, revised, (New York, American Ornithologists' Union), 430 pp., 2 maps.

Dickerson, M. C.

1906. The frog book, North American toads and frogs with a study of the habits and life histories of those of the northeastern states. (New York, Doubleday, Page & Co.), xvii + 253, 16 + 96 pls., 35 figs. in text.

Ditmars, R. L.

1907. The reptile book, a comprehensive, popularised work on the structure and habits of the turtles, tortoises, crocodilians, lizards, and snakes which inhabit the United States and northern Mexico. (New York, Doubleday, Page & Co.), 472 pp., 136 pls.

Grinnell, J.

1908. The biota of the San Bernardino mountains. Univ. Calif. Publ. Zool., **5**, 1–170, 24 pls.

1909. A new cowbird of the genus *Molothrus*, with a note on the probable genetic relationships of the North American forms. Univ. Calif. Publ. Zool., **5**, 275–281, 1 fig. in text.

1910. The Savannah sparrow of the Great Basin. Univ. Calif. Publ. Zool., **5**, 311–316.

1911. Description of a new spotted towhee from the Great Basin. Univ. Calif. Publ. Zool., **7**, 309–311.

Grinnell, J. and H. W.

1907. Reptiles of Los Angeles County, California. Throop Inst. Bull., **35**, Science Series no. 1, 64 pp., 23 figs. in text.

Hall, H. M.

1902. A botanical survey of San Jacinto Mountain. Univ. Calif. Publ. Bot., **1**, 1–140, 14 pls.

Hoffman, W. J.

1881. Annotated list of the birds of Nevada. Bull. U. S. Geol. and Geog. Surv. of the Terr., **6**, 203–256, [2] pls., map.

Merriam, C. H.

1890. Results of a biological survey of the San Francisco Mountain region and desert of the Little Colorado, Arizona. U. S. Dept. Agric., Div. Ornith. and Mamm., N. Amer. Fauna, **3**, vii + 136, frontispiece, 13 pls., 5 maps.

1892. The geographic distribution of life in North America with special reference to the Mammalia. Proc. Biol. Soc. Wash., **7**, 1–64, map.

1899. Results of a biological survey of Mount Shasta, California. Dept. Agric., Div. Biol. Surv., N. Amer. Fauna, **16**, 180 pp., 5 pls., 46 figs. in text.

Oberholser, H. C.

1904. A revision of the American great horned owls. Smithsonian Inst., U. S. Nation. Mus., Proc., **27**, 177–192.

Ridgway, R.

1877. Ornithology, *in* "Ornithology and Palaeontology," U. S. Geol. Expl. of the Fortieth Parallel, **4**, part 3, pp. 303–669.

Ruthven, A. G.

1907. A collection of reptiles and amphibians from southern New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist., **23**, 483–603, 22 figs. in text.

Stejneger, L.

1893. Annotated list of the reptiles and batrachians collected by the Death Valley expedition in 1891, with descriptions of new species. Dept. Agric., Div. Biol. Surv., N. Amer. Fauna, **7**, 159–228.

1895. The poisonous snakes of North America. Smithsonian Inst., U. S. Nation. Mus., Report, **1893**, 337–487, 19 pls., 70 figs. in text.

Sudworth, G. B.

1908. Forest trees of the Pacific Slope. (Washington, Government Printing Office), Dept. Agric., Forest Serv., 441 pp., 2 pls., 207 figs. in text.

Taylor, W. P.

1910a. Two new rodents from Nevada. Univ. Calif. Publ. Zool., **5**, 283–302, pls. 27–29.

1910b. An apparent hybrid in the genus *Dendroica*. Univ. Calif. Publ. Zool., **7**, 173–177.

1911. Mammals of the Alexander Nevada Expedition of 1909. Univ. Calif. Publ. Zool., **7**, 205–307, 2 figs. in text.

Test, F. C.

1899. A contribution to the knowledge of the varieties of the tree frog *Hyla regilla.* Smithsonian Inst., U. S. Nation. Mus., Proc., 21, 477–492, 39 pls.

Van Denburgh, J.

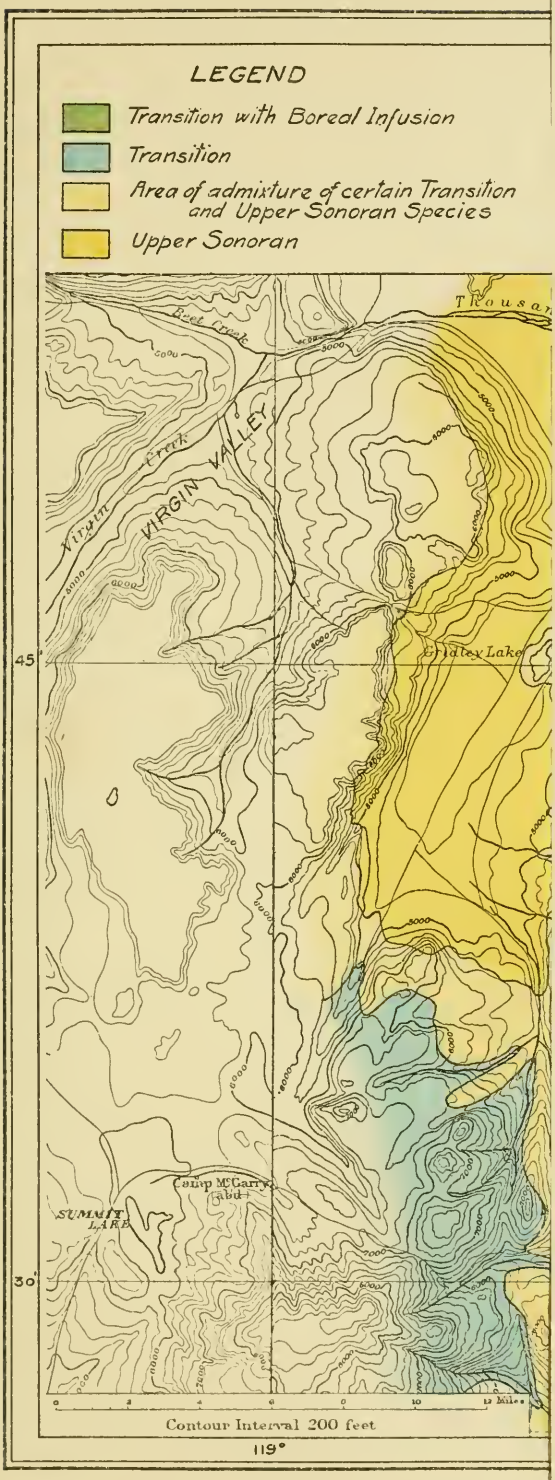
1897. The reptiles of the Pacific Coast and Great Basin. Occasional Papers of the Calif. Acad. Sci., 5, 236 pp., many unnumbered figs. in text.

EXPLANATION OF PLATES

PLATE 7

Map of the life zones of the Pine Forest Mountain region, taken from the Disaster Sheet of the United States Geological Survey Topographic Map of the United States. The dotted line beginning at Quinn River Crossing indicates the route followed by the expedition. Squares indicate base-camps (where most of the time was spent), triangles, collecting localities. The route followed by the palaeontological party is not indicated.

It should be understood that the life zones as plotted are to be regarded as approximately accurate along the route of the expedition only. At a distance from the line of actual work the zones are based on inference from altitudes, slope-exposure, and distant observation.


LEGEND
Transition with Boreal Infusion
Transition
Area of admixture of certain Transition and Upper Sonoran Species
Upper Sonoran
Thousan
Beet Creek
Virgin Creek
VIRGIN VALLEY
Gridley Lake
Camp McCarry (abd.)
SUMMIT LAKE
45°
30°
119°
Contour Interval 200 feet

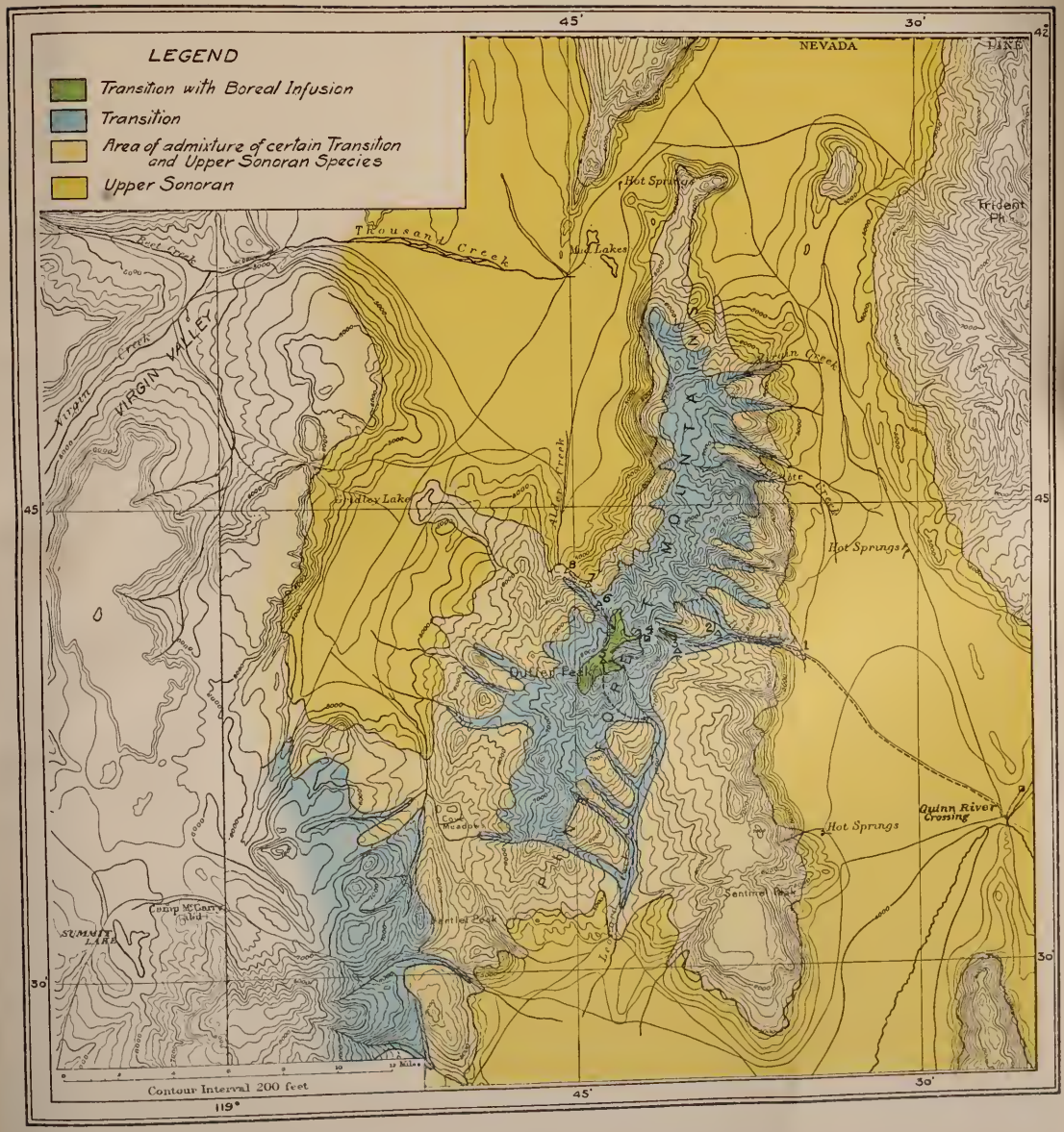

LEGEND
Transition with Boreal Infusion
Transition
Area of admixture of certain Transition and Upper Sonoran Species
Upper Sonoran
NEVADA
LINE
Hot Springs
Trident Pk.
Thousand Creek
Mud Lakes
Beet Creek
Virgin Creek
VIRGIN VALLEY
Gridley Lake
Alder Creek
Hot Springs
Outlet Peak
Cow Meadow
Hot Springs
Quinn River Crossing
Sentinel Peak
Camp McCarty Ind.
SUMMIT LAKE
Bartlet Peak
Contour Interval 200 feet
119°
45'
30'
42

PLATE 8

Fig. 1. Big Creek Ranch (Camp no. 1, 4350 feet altitude) and neighboring desert, the Pine Forest Mountains in the background, Humboldt County, Nevada; June 22, 1909. The poplars about the ranch were introduced. The meandering course of Big Creek is marked by a line of willows and alders. Big Creek Cañon is noticed on the right. The brush in the foreground is principally *Chrysothamnus, Grayia,* and *Artemisia tridentata.* Mammals inhabiting this association include *Citellus mollis, Peromyscus maniculatus sonoriensis, Perodipus microps levipes, Eutamias pictus, Onychomys brevicaudus, Perognathus parvus olivaceus, Lepus californicus wallawalla, Sylvilagus nuttalli grangeri* and *Taxidea taxus.* The commonest reptiles are *Crotaphytus wislizenii, Cnemidophorus tigris, Sceloporus graciosus,* and *Uta stansburiana.*

Fig. 2. View up Big Creek from Camp no. 2 (see map, pl. 7), 6000 feet altitude, Pine Forest Mountains, Humboldt County, Nevada; July 7, 1909. The trees along the stream are aspens, alders and willows. *Artemisia tridentata* is the chief plant on the Big Creek flats. The dark patches on the high ridge are made up of *Populus tremuloides.* The sagebrush flats are areas of admixture of Transition and Upper Sonoran species, while the animals found along the stream were chiefly Transition in distribution. *Sceloporus graciosus, Perognathus parvus olivaceus,* and *Citellus oregonus* were fairly common in the vicinity of this camp.

Fig. 1

Fig. 2

PLATE 9

Fig. 1. Basin at the head of Big Creek (Camp no. 4, 8000 feet altitude—the ridges attain a height of 9000 feet), Pine Forest Mountains, Humboldt County, Nevada; July 1, 1909. *Artemisia tridentata* is seen in the foreground. The conifers are *Pinus flexilis*, while the smaller trees and most of the brush-like patches are *Populus tremuloides*. The animals found here were for the most part Transition species, although the presence of *Nucifraga columbiana*, *Hylocichla ustulata swainsoni*, *Zonotrichia leucophrys leucophrys*, and *Sorex palustris navigator* indicates an infusion of Boreal elements.

Fig. 2. Tract of country at the head of Big Creek (near Camp no. 4, 8000 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 29, 1909. The peculiar species of meadow mouse, *Microtus* (*Lagurus*) *intermedius*, was found in the *Artemisia tridentata* shown in the foreground, and was discovered nowhere else in the mountains. Immediately back of the sagebrush a line of *Populus tremuloides* appears, and then a few limber pines (*Pinus flexilis*). The brush-like vegetation in the background is dwarfed and gnarled *Populus tremuloides*. *Nucifraga columbiana* and *Colaptes cafer collaris* were frequently heard in the pines, and *Vermivora celata orestera* was noted in the aspens.

Fig. 1

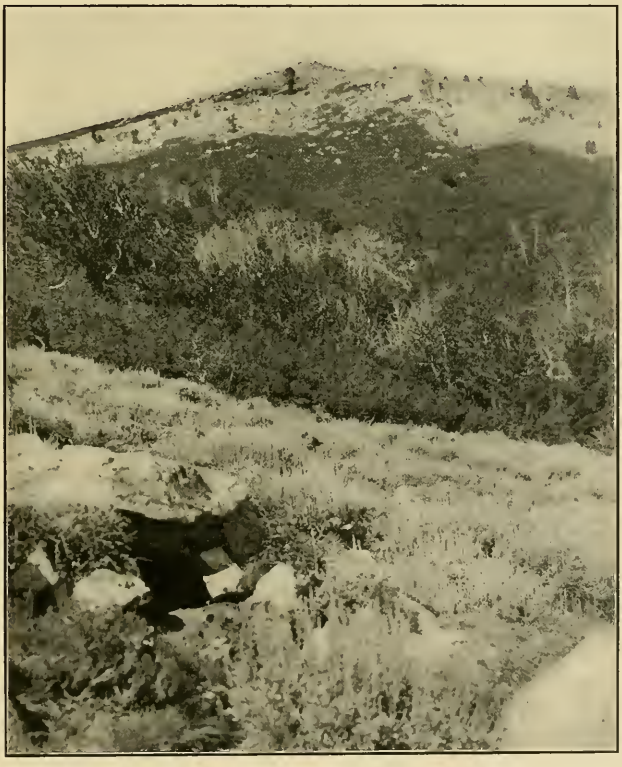


Fig. 2

PLATE 10

Fig. 1. Meadow at the head of Leonard Creek (8200 feet altitude), and a spur of Duffer Peak (9200 feet), Pine Forest Mountains, Humboldt County, Nevada; July 18, 1909. *Artemisia tridentata* appears in the foreground. The trees on the slopes of Duffer Peak are *Pinus flexilis*. *Oreoscoptes montanus, Spizella breweri, Centrocercus urophasianus* and *Sturnella neglecta* were noted in the sagebrush at this altitude. *Sialia currucoides* and *Colaptes cafer collaris* were observed in the limber pines on the slopes of Duffer Peak. Mammals most in evidence in the general neighborhood were *Citellus oregonus* and *Eutamias pictus*.

Fig. 2. Alder Creek Lake (7800 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 26, 1909. The photograph shows the character of the upper ridges of the western slope of the Pine Forest Mountains, and indicates the glacial nature of the high country. Apparently this lake was formed through the damming of a cañon by a moraine. Other moraines are seen intersecting the lake.

The scattered character of the timber is noteworthy. The scrubby trees on the right-hand side of the lake are *Cercocarpus ledifolius*, the pines in the foreground being *Pinus flexilis*. *Empidonax wrighti* and *Penthestes gambeli gambeli* were common in the limber pines.

Fig. 1

Fig. 2

PLATE 11

Fig. 1. A typical stand of limber pines (*Pinus flexilis*), altitude 9000 feet, Pine Forest Mountains, Humboldt County, Nevada; July 1, 1909. The species of birds seen most commonly in this type of environment were *Carpodacus cassini, Colaptes cafer collaris, Empidonax wrighti,* and *Nucifraga columbiana.*

Fig. 2. *Veratrum californicum* on Duffer Peak Meadow (Camp no. 5; 8400 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 11, 1909. The conifers at the left are *Pinus flexilis.* The brush-like vegetation in the background is made up of dwarfed *Populus tremuloides.* This was the collecting station having the greatest number of Boreal species. *Junco oreganus thurberi, Penthestes gambeli gambeli, Nucifraga columbiana, Zonotrichia leucophrys leucophrys, Microtus mordax, Zapus princeps oregonus* were all taken in the neighborhood.

Fig. 1

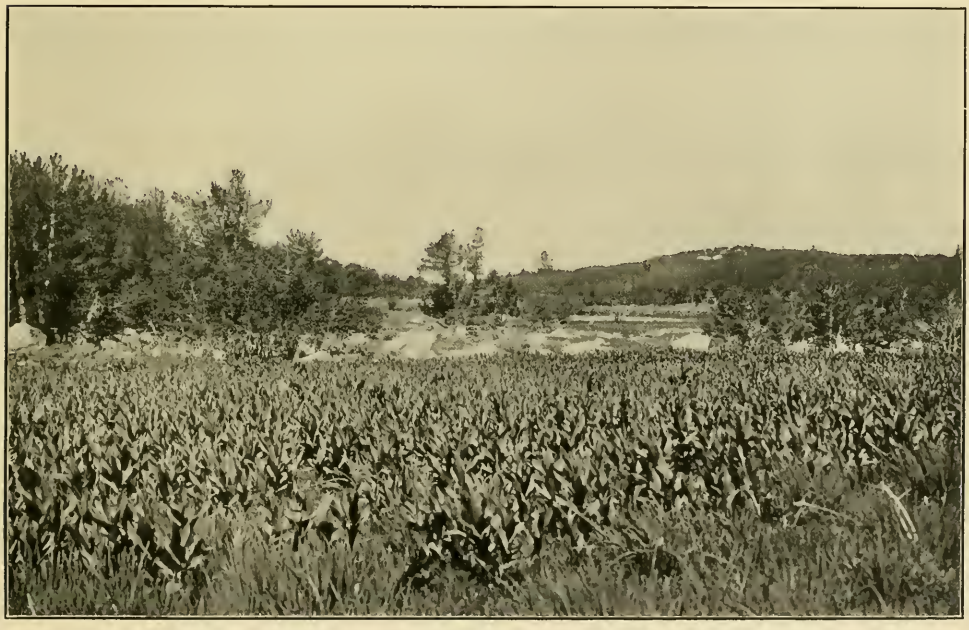


Fig. 2

PLATE 12

Fig. 1. View of a part of the largest meadow in the mountains; July 18, 1909. This is located at an altitude of 6500 feet on the western slope of the Pine Forest Mountains, Humboldt County, Nevada. Duffer Peak (9400 feet altitude), the highest point in the mountains, appears in the center background. The whitish brush on the slope in the foreground is *Artemisia tridentata.* The trees on the meadow, and the brush-like patches on the ridges and in the broad basin in the background are *Populus tremuloides. Citellus oregonus* was extremely numerous on this meadow. A coyote (*Canis lestes*) was seen here on the afternoon of July 18. *Cinclus mexicanus unicolor* was observed on Alder Creek both above and below this locality.

Fig. 2. Alder Creek (6000 feet altitude, near Camp no. 7), Pine Forest Mountains, Humboldt County, Nevada; July 15, 1909. The trees are, for the most part, *Populus tremuloides,* all the brush-like patches in the background as well as nearly all the trees along the stream being of this species. Associated with the aspens along the stream are a few willows. The hillsides are clothed with *Artemisia tridentata. Zapus princeps oregonus, Putorius cicognani,* and *Neotoma cinerea occidentalis* were taken at this locality. *Citellus oregonus* ranged down nearly to it, and *Sylvilagus auduboni grangeri* invaded the mountains along exposed ridges to a greater altitude than that of this camp. This is a fair illustration of an intermingling of lower and higher zonal elements. The locality is on the whole good Transition, at least along the stream.

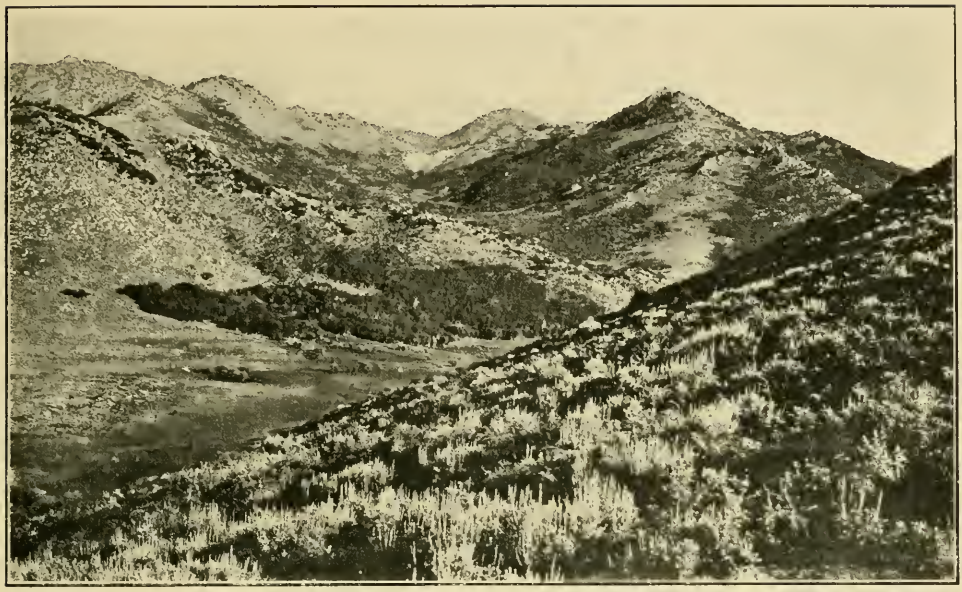


Fig. 1

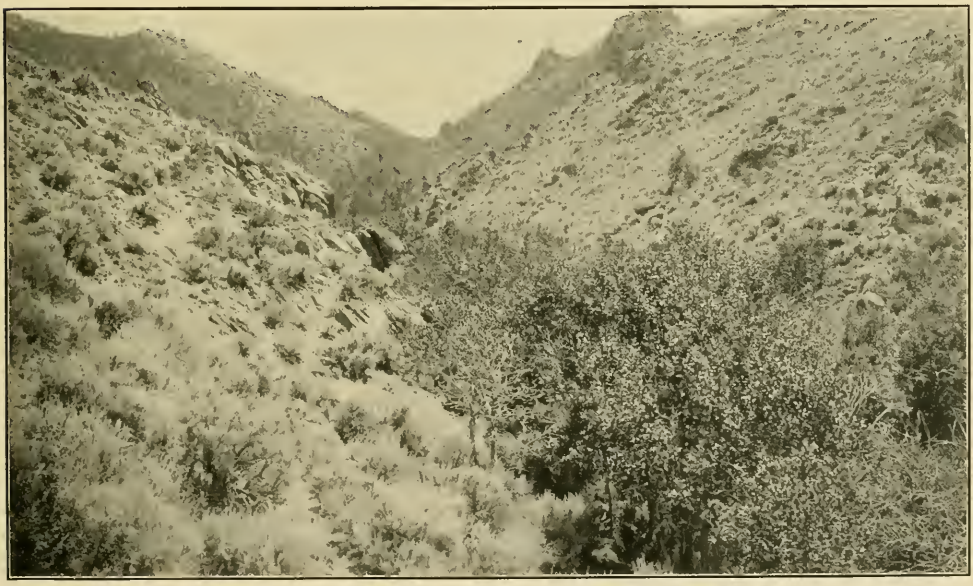


Fig. 2

INDEX*

Titles of papers and names of new species in **boldface**; synonyms in *italics*.

Acanthis linaria linaria, 27, 83.
Accipter velox, 27, 60, 360.
Achillaea millefolium lanulosa, 326, 328, 337, 338.
Aconitum columbianum, 328, 329, 338.
Actitis macularius, 27, 54, 360.
Admiralty island, 26.
Aegialitis semipalmata, 27, 55.
Aëronautes melanoleucus, 370.
Agelaius phoeniceus (subsp. indet.), 334, 382.
Agelaius phoeniceus sonoriensis, 382.
Alaska, southeastern, birds, 28; their distributon, 151; description of localities, 12; faunal areas, 151; mammals, 113; their distribution, 151.
Alaska Expedition of 1909, Birds and Mammals of, 9; itinerary, 10.
Alces americanus gigas, 24.
Alexander, Annie M., donations, 11, 182, 205.
Alexander expeditions: Southeastern Alaska, 9; Nevada, 1909, 205.
Allium validum, 328, 329, 338.
Alnus tenuifolia, 326, 337, 339.
Amelanchier alnifolia, 329, 338.
Ammospermophilus leucurus leucurus, 208, 219, 222, 332, 334, 335.
Amphibians, Reptiles and Birds, The, of northern Humboldt County, Nevada, 342.
Amphispiza bilineata deserticola, 334, 335, 396.
nevadensis nevadensis, 334, 335, 397, 398.
Anas platyrhynchos, 26, 41, 357.
Annette island, 19.
Anser albifrons gambeli, 26.
Antelope, American prong-horned, 211.
Antilocapra americana, 208, 211.
Anthus rubescens, 28, 104.
Antrozous pallidus pallidus, 208, 303, 334, 335.
Aphelocoma woodhousei, 334, 378.
Aphriza virgata, 27, 55.
Aphyllon fasciculatum, 328, 331.
Aquila chrysaëtos, 365.
Aquilegia truncata, 328, 337.
Archibuteo lagopus sancti-johannis, 27, 62.
Ardea herodias fannini, 26, 47, 159.
Arenaria melanocephala, 27, 56.
Arizona, Two new Owls from, 1.
Arnica chamissonis, 328, 331, 338.
Arquatella maritima couesi, 27, 50.
Artemisia ludoviciana, 323.
spinescens, 323, 337.
tridentata, 323, 325, 327, 337, 338, 350, 414, 428, 430, 432, 434.
Asio flammeus, 27, 64.
wilsonianus, 27, 64, 366.
Aspens, quaking, 325, 327, 330, 331.
Astragalinus psaltria hesperophilus, 389.
Astur atricapillus striatulus, 27, 61.
Atophyrax, 302.
Auklet, rhinoceros, 31.
Avocet, 360.
Badger, American, 296.
Bailey, Vernon, 206.
Bascanion taeniatum, 335, 353.
Bat, Alaska brown, 151.
long-legged, 302.
pallid, 303.

* Univ. Calif. Publ. Zool., vol. 7.

Bear, black, 25.
island black, 141.
brown, 26, 143.
grizzly, 25, 144.
Beaver, 19, 158.
Pacific, 122.
Bibliography, 8, 160, 177, 195, 304, 311, 318, 423.
Birds and Mammals of the 1909 Alexander Alaska Expedition, 9.
Birds of northern Humboldt County, Nevada, 356.
Blackbird, Brewer, 386.
rusty, 80.
yellow-headed, 381.
Bluebird, mountain, 112, 421.
Bobolink, 380.
Boca de Quadra, 18.
Bombycilla cedrorum, 28, 97.
Bonasa umbellus umbelloides, 24.
Brachyramphus marmoratus, 26, 33.
Bradfield canal, 21.
Branta canadensis occidentalis, 26, 46, 159.
Bryan, W. A., 183.
Bubo virginianus
occidentalis, 367.
pallescens, 366, 367.
saturatus, 27, 65.
Buffle-head, 43; comparative abundance of sexes, 43.
Bufo boreas, 343.
nelsoni, 344.
lentiginosus, 359.
woodhousei, 344.
Bunting, lazuli, 404.
snow, 83.
Bush-tit, lead-colored, 419.
Buteo borealis alascensis, 27, 61.
calurus, 364.
Calcarius lapponicus alascensis, 27, 84.
Calder bay, 14.
Callisaurus ventralis, 353.
Callospermophilus, 335, 336.
trepidus, 208, 220, 222, 330, 339.
Canachites franklini, 27, 58.
Canis estor, measurements, 294.
lestes, 208, 293, 295, 330, 336, 436; measurements, 294.
ochropus, 295; measurements, 294.
pambasileus, 113, 136.
Carpodacus amplus, 186.
cassini, 179, 335, 336, 387, 434.
clementis, 193.
frontalis, 179, 185.
megregori, 185.
mexicanus frontalis, 334, 335, 388.
purpureus, 179.
Castanopsis, 328.
Castilleia parvifolia, 326, 337.
Castor canadensis leucodontus, 113, 122.
Cathartes aura septentrionalis, 364.
Ceanothus velutinus, 328, 338.
Centrocercus urophasianus, 332, 333, 362, 432.
Cepphus columba, 26, 33.
Cercocarpus ledifolius, 337, 338, 432.
Cerorhinca monocerata, 26, 31.
Certhia familiaris occidentalis, 28, 105.
Ceryle alcyon, 367.
caurina, 27, 66.
Chaetura vauxi, 27, 73.
Charitonetta albeola, 26, 43.
Chat, long-tailed, 413.
Chen hyperboreus, 26, 45.
Chickadee, chestnut-backed, 106.
mountain, 418.
Chichagof island, 26.
Chickamin river, 20.
Chinquapin, 333.
Chipmunk, desert, 222.
Chondestes grammacus strigatus, 328, 334, 335, 391.
Chordeiles virginianus hesperis, 369.
Chrysothamnus nauseosus, 323.
viscidiflorus tortifolius, 337.
Cinclus mexicanus unicolor, 28, 104, 335, 336, 413, 436.
Circus hudsonius, 27, 59, 364.
Citellus beecheyi fisheri, 215.
mollis, 208, 216, 217, 218, 222, 322, 334, 335, 428.
oregonus, 208, 213, 214, 215, 222, 295, 327, 333, 335, 336, 432, 436.
tereticaudus, 218.
townsendi, 214.
Cladothamnus pyrolaeflorus, 24.
Clangula clangula americana, 26, 43.
Cnemidophorus tigris, 334, 335, 336, 347, 352, 428.
Colaptes auratus luteus, 176.
cafer collaris, 176, 367, 430, 432, 434.
saturatior, 27, 70, 158.
Colymbus auritus, 26, 29.
holboelli, 28.
Coot, American, 358.
Cormoraut, pelagic, 38.

Coronation island, 14.
Corvus brachyrhynchos caurinus, 27, 80.
corax principalis, 27, 79.
sinuatus, 378.
Cottontail, Black Hills, 288.
Cowbird, Nevada, 380.
Coyote, Great Basin, 293.
Crane, little brown, 47.
Creeper, tawny, 105.

Crossbill, Sitka, 81.
white-winged, 82.
Crotalus, 335.
species indet., 355.
lucifer, 355.
Crotaphytus collaris baileyi, 326, 334, 335, 346.
wislizenii, 326, 334, 335, 346, 347, 350, 428.
Crow, northwestern, 80.
Cryptoglaux acadica scotaea, 27, 65.
Cyanocitta stelleri, 158.
carlottae, 78.
stelleri, 27, 77.
Cypseloides niger borealis, 27, 71.
Dafila acuta, 26, 42, 357.
Dall island, 17.
Deer, mule, 208.
Sitka, 113.
Sitka black-tailed, 158.
Dendragapus obscurus fuliginosus, 27, 56.
Dendroica aestiva brewsteri, 324, 334, 336, 409.
rubiginosa, 28, 98.
auduboni, 173; breeding range, 175.
auduboni, 335, 336, 411.
coronata, 173, 175, 411; breeding range, 175.
hooveri, 28, 99.
striata, 24, 28, 100.
townsendi, 100.
Dipodomys merriami nevadensis, 208, 272, 334, 335; measurements, 273.
simiolus, 272; measurements, 273.
Dipper, American, 104.
northern, 413.
Dolichonyx oryzivorus, 380.
Dove, mourning, 363.
Dowitcher, long-billed, 49.
Dryobates pubescens glacialis, 27, 68.
villosus harrisi, 27, 66, 313.
picoideus, 67, 313.
sitkensis, 315; measurements, 317.
Duck, greater scaup, 42.
harlequin, 44.
Duke island, 18.
Eagle, bald, Alaska, 62.
golden, 365.
Egg harbor, 15.
Elymus pubiflorus, 328.
Empidonax difficilis, 27, 76, 158.
griseus, 375.
hammondi, 374.
trailli alnorum, 27, 76, 159.
trailli, 374.
wrighti, 335, 374, 432, 434.
Erethizon epixanthum, 208, 287, 326, 335, 336.
couesi, 287.
nigrescens, 113, 135.
Ereunetes mauri, 27, 53.
pusillus, 27, 52.
Etolin island, 21.
Euphagus carolinus, 27, 80.
cyanocephalus, 382, 386.
Eutamias palmeri, 223.
pictus, 208, 222, 223, 224, 225, 226, 324, 329, 330, 334, 336, 410, 428, 432.
speciosus 227.
Evotomys **phaeus,** 113, 127.
wrangeli, 127.
Falco columbarius columbarius, 27, 63.
mexicanus, 365.
sparverius phalaena, 366.
sparverius, 27, 63.
Falcon, prairie, 365.
Fiber zibethicus spatulatus, 113, 133.
Field Notes on Amphibians, Reptiles and Birds of Northern Humboldt County, Nevada, 319.
Finch, Cassin purple, 329, 387.
Flicker, northwestern, 70.
red-shafted, 329, 367.
Flycatcher, alder, 76.
olive-sided, 75, 373.
Traill, 374.
western, 76.
Wright, 374.
Fool's inlet, 21.
Forrester island, 17.
Freshwater bay, 26.
Frog, Pacific tree, 342.
Fulica americana, 358.
Gallinago delicata, 26, 48.
Game cove, 26.
Gavia immer, 26, 29.
pacifica, 26, 30.
stellata, 26, 30.
Geothlypis trichas occidentalis, 24, 28, 101, 159, 334, 412.

Gilman, M. French, 3.
Goat, mountain, Columbian, 118.
Golden-eye, 43.
Goldfinch, green-backed, 389.
Goose, American white-fronted, 46.
snow, 45.
white-cheeked, 46.
Gopher, pocket, Fisher, 258.
Nevada, 262.
Goshawk, western, 61.
Gravina island, 19.
Gravia spinosa, 323, 337.
Grebe, Holboell, 28.
horned, 29.
Grinnell, Joseph, 179, 197, 206, 309.
Grosbeak, black-headed, 404.
Kadiak pine, 81.
Grouse, Franklin, 16, 58.
ruffed, 24.
sooty, 16, 56.
Grus canadensis, 26, 47.
Gull, Bonaparte, 36.
glaucous-winged, 34.
herring, 35.
ring-billed, 356.
short-billed, 35.
Haematopus bachmani, 27, 56.
Haliaeëtus leucocephalus alascanus, 26, 62.
Hall, H. M., 12.
Harelda hyemalis, 26, 44.
Hasselborg, Allen E., 10.
Hassler harbor, 19.
Hassler's pass, 21.
Hawaiian islands, linnet, 179; introduction into, 184.
Hawk, Alaska red-tailed, 61.
American rough-legged, 62.
marsh, 59, 364.
sharp-shinned, 60, 364.
sparrow, American, 63.
desert, 366.
Hearst, Mrs. Phoebe A., donation, 201.
Heceta island, 16.
Helminthophila chrysoptera, 176.
cincinnatiensis, 176.
lawrencei, 176.
leucobronchialis, 176.
pinus, 176.
Helodromas solitarius cinnamomeus, 27, 53.
Henshaw, H. W., 182, 206.
Heron, black-crowned night, 357.
northwestern blue, 47.
Heteractitis incanus, 26, 54.
Hirundo erythrogaster, 406.
palmeri, 28, 95.
Histrionicus histrionicus, 26, 44.
Hollister, N., 12.
Humboldt County, Northern, Nevada, faunal features, 319; itinerary in, 321; amphibians, 342; mammals, 205; reptiles, 346; birds, 356.
Hummingbird, broad-tailed, 370.
rufous, 73, 371.
Hybrid, An Apparent, in the Genus Dendroica, 173.
Hybrid, warbler, 175.
Hybridism, 173, 176.
Hydrochelidon nigra surinamensis, 356.
Hyla regilla, 342, 343.
Hylocichla guttata nana, 28, 109.
ustulata swainsoni, 328, 329, 335, 336, 337, 420, 430.
ustulata, 28, 109.
Hypericum formosum, 338.
Icteria virens longicauda, 334, 413.
Icterus bullocki, 332, 334, 385.
Iridoprocne bicolor, 28, 96, 407.
Iris missouriensis, 325, 328, 332, 338.
Ixoreus naevius, 28, 111.
Jackrabbit, Washington, 291.
Jay, Steller, 77.
Woodhouse, 378.
Junco hyemalis hyemalis, 28, 87.
thurberi, 335, 336.
oreganus oreganus, 28, 88.
thurberi, 395, 434.
Junco, Oregon, 88.
Sierra, 395.
slate-colored, 87.
Kake islands, 13.
Kellogg, Miss Louise, 205.
Killdeer, 361.
Kingbird, eastern, 371.
western, 372.
Kingfisher, belted, 367.
northwestern belted, 66.
Kinglet, ruby-crowned, 419.
western golden-crowned, 107.
Sitka, 108.
Klawak passage, 14.
Klawak Salt Lake, 16.
Kofoid, Charles A., 12, 206.
Kosciusko island, 14.
Kuiu island, 13, 15.
Kupreanof island, 12.
Lagopus lagopus, 24.
rupestris dixoni, 27, 59.
Lanius borealis invictus, 28, 97.
ludovicianus excubitorides, 407.
Lark, dusky horned, 376.
Larus argentatus, 26, 35.
brachyrhynchus, 26, 35.

delawarensis, 356.
glaucescens, 26, 34.
philadelphia, 26, 36.
Lepus californicus deserticola, 291.
wallawalla, 208, 285, 291, 326, 334, 335, 428.
Life-zones of the Pine Forest mountain region, 333; discussion, 338.
Linnet, The, of the Hawaiian Islands; a Problem in Speciation, 179.
Linnet, 388, 389; coloration: according to age, 179; in captivity, 187; causes, 190; correlation of with climatic areas, 193; formation, 188; feather structure, 181; introduction into Hawaiian Islands, 184; molt, 179; nuptial plumage, 180; table of, 193; variation, 180, 188.
Linnet, California, 179, 180, 181, 182, 188, 189.
Hawaiian, 188, 191, 194; its color-characters, 194.
Lizard, Bailey, 346.
brown-shouldered, 348.
desert horned, 351.
whip-tailed, 352.
mountain, 349.
rock, 350.
Lobipes lobatus, 26, 48, 358.
Longspur, Alaska, 84.
Loon, common, 29.
Pacific, 30.
red-throated, 30.
Loxia americana sitkensis, 27, 81.
leucoptera, 27, 82.
Lunda cirrhata, 26, 31.
Lupinus laxiflorus, 327.
Lutra canadensis periclyzomae, 113, 138.
Lutreola vison nesolestes, 113 ,139.
Lynx baileyi, 208, 293.
Macrorhamphus griseus scolopaceus, 27, 49.
Mahogany, mountain, 324, 333.
Magpie, American, 77, 377.
Mailliard, Joseph, donation, 199.
Mallard, 41, 357.
Mammals of the Alexander Nevada Expedtion of 1909, 205.
Mammals, method of measurement, 206; breeding season, definite periods, 207.
Marila affinis, 42.
marila, 26, 42.
Marmot, hoary, 120.
Vancouver Island, 201.
Yukon, 203.
Marmota caligata, 113, 120.
engelhardti, 211.
flaviventer, 208, 211, 336.
ochracea, 201, 203.
vancouverensis, 201, 202.
Marmots, Two New Species of, from Northwestern America, 201.
Marten, Queen Charlotte, 139.
Marten Arm, 18.
Meadowlark, western, 384.
Meadow-mouse, Drummond, 128.
Coronation Island, 131.
Olympic, 129.
Melospiza lincolni gracilis, 28, 91.
melodia caurina, 28, 90.
heermanni, 197.
mailliardi, 197, 198.
maxillaris, 197, 198.
montana, 199, 334, 336, 399.
rufina, 28, 89.
saltonis, 198.
samuelis, 198.
Mentzelia albicaulis ,323.
Merganser, American, 39.
red-breasted, 40.
Mergus americanus, 26, 39.
serrator, 26, 40.
Merriam, C. Hart, 12, 206.
Microtus **coronarius**, 113, 131, 158.
curtatus, 253; measurements, 255.
drummondi, 24, 113, 128.
intermedius, 257, 336.
Microtus (Lagurus), 335.
intermedius, 208, 253, 430; measurements, 255.
macrurus, 113, 129.
mordax, 208, 251, 257, 326, 329, 330, 333, 335, 336, 337, 339, 434; measurements, 252.
pallidus, 253; measurements, 255.
pauperrimus, 253; measurements, 255.
Miller, L. H., 184, 187.
Mimus polyglottos leucopterus, 414.
Mink island, 139.
Mitkof island, 22.
Mockingbird, 414.
Modesto Song Sparrow, The, 197.
Molothrus ater artemisiae, 334, 380.
Moose, 24.
Morcom, G. Frean, 7.
Mouse, cañon, 235.
Dall Lemming, 134.
harvest, desert, 237.

Jumping, Alaska, 135.
Stikine, 135.
Blue Mountains, 281.
Meadow, cantankerous, 251.
intermediate short-tailed, 253.
Pocket, Great Basin, 274.
Nevada, 279.
red-backed, dark-colored, 127.
short-tailed grasshopper, 228.
white-footed, 228.
Rhoads white-footed, 123.
Osgood white-footed, 124.
Sitka white-footed, 126.
Murre, California, 34.
Murrelet, ancient, 32.
marbled, 33.
Muskrat, northwest, 133.
Mustela nesophila, 113, 139.
Mutation, possibility of, in birds, 176.
Myiochanes richardsoni richardsoni, 27, 75, 336, 373.
Myotis lucifugus alascensis, 113, 151.
longicrus, 208, 302, 330, 335, 336.
Nannus hiemalis pacificus, 28, 104.
Neosorex, 302.
Neotoma cinerea cinerea, 249.
occidentalis, 208, 249, 331, 333, 339, 436.
desertorum, measurements, 248.
nevadensis, 208, 243, 248, 326, 332, 334, 335.
Nettion carolinense, 26, 42, 357.
Nevada, Alexander expedition of 1909, 205; field notes on northern Humboldt County, 319.
Nighthawk, Pacific, 369.
Nucifraga columbiana, 331, 337, 379, 430, 434.
Nutcracker, Clarke, 329, 330, 379.
Nuthatch, red-breasted, 106, 418.
Nuttallornis borealis, 27, 74, 373.
Nycticorax nycticorax naevius, 357.
Odocoileus columbianus sitkensis, 113, 117, 158.
hemionus, 208, 330, 333, 335, 336.
Oidemia americana, 26, 44.
deglandi, 26, 45.
perspicillata, 26, 45.
Old-squaw, 44.
Onychomys brevicaudus, 208, 228, 326, 334, 335, 428.
Oporornis formosa, 176.
tolmiei, 28, 101, 335, 336, 412.
Oreamnos montanus columbianus, 113, 118.
Oreortyx picta plumifera, 335, 336, 361.
Oreoscoptes montanus, 324, 333, 334, 336, 413, 414, 432.
Oreospiza chlorura, 335, 336, 402.
Oriole, Bullock, 385.
Osgood, Wilfred H., 206.
Osprey, American, 64.
Otocoris alpestris merrilli, 324, 376.
Otter, 19, 158.
Island, 138.
Otus asio gilmani, 1, 2.
Owl, burrowing, 367.
horned, dusky, 65.
western, 366.
long-eared, 366.
American long-eared, 64.
saw-whet, northwest, 65.
screech, Sahaura, 1.
short-eared, 64.
spotted, Arizona, 1, 3.
Owls, Two New, from Arizona, with Description of the Juvenal Plumage of Strix occidentalis occidentalis (Xantus), 1.
Oyster-catcher, black, 56.
Oxyechus vociferus, 361.
Pandion haliaëtus carolinensis, 27, 64.
Passer domesticus, 388, 405.
Passerculus sandwichensis alaudinus, 390.
nevadensis, 334, 390.
sandwichensis, 27, 84.
savanna, 27, 85.
Passerella iliaca insularis, 28, 93.
schistacea, 335, 336, 400.
townsendi, 28.
Passerina amoena, 334, 336, 404.
Pelidna alpina sakhalina, 27, 52.
Penthestes gambeli gambeli, 335, 336, 418, 432, 434.
rufescens rufescens, 28, 106.
Pentstemon confertus caeruleopurpureus, 328, 331.
Perodipus columbianus, 267; measurements, 268.
microps levipes, 208, 267, 326, 335, 428; measurements, 268, 269, 270.
Perognathus nevadensis, 208, 279, 280, 334, 335.
parvus magruderensis, 275, 278.
mollipilosus, 275, 278.
olivaceus, 208, 274, 275, 278, 324, 333, 334, 336, 428; measurements, 276, 277.
parvus, 275.

Peromyscus crinitus, 208, 235, 329, 334, 335, 338; measurements, 236.
maniculatus hylaeus, 113, 124, 157; distribution, 156.
macrorhinus, 113, 123, 157; distribution, 156.
sonoriensis, 208, 228, 329, 330, 336, 428; breeding data: males, 234; females, 235; measurements, 230, 231.
sitkensis, 113, 126, 157; distribution, 156.
Petrochelidon lunifrons lunifrons, 405.
Pewee, western wood, 75, 373.
Phalacrocorax pelagicus, 26, 38.
Phalaenoptilus nuttalli nuttalli, 369.
Phalarope, northern, 48, 358.
Wilson, 359.
Phoebe, 326.
Say, 373.
Phrynosoma platyrhinos, 326, 332, 334, 335, 351.
Pica pica hudsonia, 27, 77, 377.
Picoides americanus americanus, 27, 69.
Pigeon guillemot, 33.
Pine Forest mountain region, life-zones, 333; discussion, 338.
Pine, limber, 432, 434.
Pinicola enucleator flammula, 27, 81.
Pintail, 42, 357.
Pinus flexilis, 324, 329, 331, 338, 430, 432, 434.
Pipilo maculatus arcticus, 310.
curtatus, 309, 311, 334, 336, 401.
megalonyx, 309, 310, 311, 401.
montanus, 309, 310, 311.
Pipit, American, 104.
Piranga ludoviciana, 28, 95, 159, 405.
Pisobia bairdi, 27.
maculata, 27.
minutilla, 27, 51.
Pituophis catenifer deserticola, 335, 354.
Planesticus migratorius caurinus, 28, 110.
propinquus, 336, 420.
Plectrophenax nivalis nivalis, 27, 83.
Poa buckleyana, 323, 337.
Poœcetes gramineus confinis, 334, 389.
Poor-will, Nuttall, 369.
Populus balsamifera, 332.
tremuloides, 325, 326, 337, 339, 428, 430, 434, 436.
tremuloides, 325, 326, 337, 339, 428, 430, 434, 436.
Porcupine, 287.
dusky, 135.
Port McArthur, 15.
Port McLean, 18.
Port Protection, 14.
Port St. John, 22.
Port Snettisham, 23.
Portage Cove, 20.
Porzana carolina, 358.
Preble, E. A., 12, 206.
Prince of Wales island, 14, 16.
Prunus demissa, 329, 338.
Psaltriparus minimus californicus, 419.
plumbeus, 334, 419.
Ptarmigan, Dixon rock, 59.
willow, 24.
Puffin, tufted, 31.
Putorius arizonensis, 208, 262, 299, 335, 336, 337.
cicognani, 208, 262, 298, 331, 335, 336, 337, 436.
alascensis, 113, 140.
muricus, 298.
xanthogenys, 300.
Quail, plumed, 361.
Querquedula cyanoptera, 357.
Racer, striped, 353.
Radicula sinuata, 323.
Rail, Sora, 358.
Rat, kangaroo, Nevada, 272.
Panamint, 267.
wood, Nevada, 243.
western bushy-tailed, 249.
Rattlesnake, 355.
Raven, northern, 79.
western, 378.
Recurvirostra americana, 360.
Redpoll, 83.
Red-tail, western, 330, 364.
Red-wing, 382.
Regulus calendula calendula, 419.
grinnelli, 28, 108.
satrapa olivaceus, 28, 107.
Reithrodontomys klamathensis, 238, 239, 240; measurements, 241.
megalotis deserti, 208, 237, 238, 239, 240, 333, 334, 335, 338; measurements, 238, 239, 241.
longicauda, 239; measurements, 241.
megalotis, 239, 240.
Reptiles of northern Humboldt County, Nevada, 346.
Revillagigedo island, 20, 21.
Ribes aureum, 323.
cereum, 328, 329, 338.

Richardson, Jr., Charles H., 205.
Ridgway, R., 3, 314.
Riparia riparia, 28, 96.
Robin, northwestern, 110.
western, 326, 329, 420.
Rocky bay, 17.
Rosa blanda, 323.
Sagebrush, 324, 332, 350.
Sage hen, 362, 363.
Salix fluviatilis exigua, 323.
Salpinctes obsoletus obsoletus, 416.
San Alberto bay, 16.
Sandpiper, Aleutian, 50; Baird, 51; least, 51; pectoral, 50; red-backed, 52; semi-palmated, 52; spotted, 54, 360; western, 53; western solitary, 53.
Sapsucker, red-breasted, 69.
Sarcobatus vermiculatus, 323, 337.
Sayornis sayus, 373.
Scahiopus hammondi, 345.
Sceloporus biseriatus, 326, 334, 335, 346, 349, 350.
graciosus, 324, 335, 347, 349, 350, 428.
Sciuropterus alpinus zaphaeus, 113, 121.
Sciurus hudsonius petulans, 120.
vancouverensis, 113, 118.
Scoter, American, 45.
surf, 45.
white-winged, 45.
Selasphorus platycercus, 335, 336, 370.
rufus, 27, 73, 371.
Shakan, 14.
Shrew, long-tailed, 150.
navigator, 301.
Streator, 150.
Shrike, Alaska, 97.
white-rumped, 407.
Sialia currucoides, 24, 28, 112, 335, 336, 421, 432.
Siskin, pine, 83, 389.
Sisymbrium canescens, 328, 338.
Sitta canadensis, 28, 106, 418.
Snake, garter, wandering, 354.
gopher, desert, 354.
Snipe, Wilson, 48.
Snyder, J. O., 12.
Sorex obscurus, 158.
glacialis, 158.
longicauda, 113, 150, 158.
palustris navigator, 208, 301, 329, 335, 336, 337, 430.
personatus streatori, 113, 150.
Spadefoot, western, 345.
Sparrow, black-throated, 326.
Brewer, 331, 393, 394, 396, 397, 416.
chipping, western, 331, 393.
desert, 396.
English, 389, 405.
Forbush, 91.
fox, 416.
Kadiak fox, 93.
thick-billed fox, 329.
slate-colored fox, 400.
golden-crowned, 86.
intermediate, 86.
lark, western, 391.
sage, 333, 396, 398.
Nevada sage, 397.
Savannah, 85.
Aleutian Savannah, 84.
Nevada Savannah, 390.
western Savannah, 390.
song, Modesto, 196.
Montana, 399.
sooty, 89.
Yakutat, 90.
tree, western, 87.
Townsend, 93.
vesper, 333.
western vesper, 389.
white-crowned, 330, 331, 333, 355, 392.
Speciation, problem in, 179.
Speotyto cunicularia hypogaea, 367.
Sphyrapicus varius ruber, 27, 69, 158.
Spinus pinus, 27, 83, 335, 336, 389.
Spizella breweri, 333, 334, 336, 393, 394, 395, 397, 398, 432.
monticola ochracea, 28, 87.
passerina arizonae, 336, 393.
Squatarola squatarola, 27, 55.
Squirrel, ground, antelope, 219.
Nevada golden-mantled, 220.
Oregon, 213, 331.
Piute, 216.
Osgood flying, 121.
Vancouver island, 118.
Steganopus tricolor, 359.
Stelgidopteryx serripennis, 407.
Sterna paradisaea, 26, 38.
Strix occidentalis, 6.
caurina, 8.
huachucae, 3, 5, 8.
occidentalis, 8.
Sturnella neglecta, 384, 432.
Suemez island, 17.
Swallow, bank, 96.
barn, American, 406.
western, 95.
cliff, 405.
northern violet-green, 96, 407.
rough-winged, 407.
tree, 96, 407.

Swarth, Harry S., 1, 9, 201, 313.
Swift, black, 71.
white-throated, 370.
Sylvilagus nuttalli grangeri, 208, 288, 291, 331, 334, 428, 436.
nuttalli, 288, 291.
pinetis, 288.
Synaptomys dalli, 113, 135.
Synthliboramphus antiquus, 26, 32.
Syrnium occidentale, 5.
Tachycineta thalassina lepida, 28, 96, 335, 407.
Taku river, 24.
Tanager, western, 95, 405.
Taraxacum officinale, 323.
Tattler, wandering, 54.
Taxidea taxus, 208, 296, 334, 428.
neglecta, 296.
Taylor, Walter P., 173, 205, 319.
Teal, cinnamon, 357.
green-winged, 42, 357.
Telmatodytes palustris plesius, 417.
Tern, arctic, 38.
black, 356.
Tetradymia spinosa, 323, 337.
Thamnophis vagrans, 324, 336, 354.
Thomas bay, 23.
Thomomys fuscus fisheri, 208, 258, 266, 328; measurements, 259, 260.
nevadensis, 208, 261, 262, 266, 326, 332, 334, 335; measurements, 263, 265.
Thrasher, sage, 413, 415, 416.
Three-mile arm, 13.
Thrush, hermit, dwarf, 109.
olive-backed, 331, 420.
russet-backed, 109, 329.
varied, 111.
Toad, mountain, 343.
Rocky Mountain, 344.
Torrey, H. B., 192.
Totanus flavipes, 53.
melanoleucus, 27, 53.
Towhee, New Spotted, from the Great Basin, Description of, 309.
Towhee, green-tailed, 327, 329, 331, 332, 333, 402, 416.
Nevada, 309, 401.
Troglodytes aëdon parkmani, 417.
Turnstone, black, 56.
Tyrannus tyrannus, 334, 371, 372.
verticalis, 332, 334, 372.
Uria troille californica, 26, 34.
Ursus americanus **pugnax,** 113, 141.
emmonsi, 146, 147.
sitkensis, 26.
Uta stansburiana, 326, 334, 335, 348, 428.
Veratrum californicum, 325, 328, 329, 338, 434.
Vermivora celata celata, 28, 97.
lutescens, 28, 98.
orestera, 335, 336, 409, 430.
Vicia americana, 323, 337.
Vireo, western warbling, 331, 408.
Vireosylva gilva swainsoni, 327, 334, 408.
Vulture, turkey, 364.
Warbler, Audubon, 329, 330, 411.
blackpoll, 100.
hybrid, 175.
lutescent, 98.
Oberholser lutescent, 409.
MacGillivray, 412.
myrtle, 173.
Alaska myrtle, 99, 411.
orange-crowned, 97.
pileolated, 103, 413.
Tolmie, 101.
Townsend, 100.
yellow, Alaska, 98.
California, 410.
Warren island, 16.
Waxwing, cedar, 97.
Weasel, Alaska, 140.
mountain, 299.
Wild cat, 293.
Wilsonia pusilla pileolata, 28, 103, 413.
Wolf, Alaska timber, 136.
Wolverine, 19.
Wood pewee, western, 326.
Woodchuck, yellow-bellied, 211.
Woodpecker, Description of a New Hairy, from Southeastern Alaska, 313.
Woodpecker, hairy, Sitka, 315.
Harris, 66.
three-toed, American, 69.
Valdez downy, 68.
Wrangell island, 21.
Wren, house, western, 417.
marsh, western, 417.
rock, common, 329, 416.
winter, western, 104.
Xanthocephalus xanthocephalus, 334, 381, 382.
Yellow-legs, 53.
greater, 53.
Yellowthroat, western, 101, 412.
Zamelodia melanocephala, 403.

Zapus hudsonius alascensis, 113, 135.
major, 281, 285; measurements, 282, 284.
montanus, 285.
nevadensis, 285.
orarius, 285.
pacificus, 285.
princeps oregonus, 208, 281, 285, 286, 329, 330, 331, 335, 339, 434, 436; measurements, 282, 283.
saltator, 24, 113, 135.
trinotatus, 285.
Zarembo island, 22.
Zenaidura macroura carolinensis, 336, 363.
Zonotrichia coronata, 27, 86.
leucophrys gambeli, 27, 86.
leucophrys, 328, 329, 335, 336, 337, 355, 392, 430, 434.

6. Two New Rodents from Nevada, by Walter P. Taylor. Pp. 283-302, plates 27-29.

7. A Northern Coast Form of the California Gray Fox, by Joseph Dixon. Pp. 303-305.
Nos. 6 and 7 in one cover. February, 1910 ..... .20

8. Two Heretofore Unnamed Wrens of the Genus Thryomanes, by Joseph Grinnell. Pp. 307-309.

9. The Savannah Sparrow of the Great Basin, by Joseph Grinnell. Pp. 311-316.

10. A Second Record of the Spotted Bat (*Euderma maculatum*) for California, by Joseph Grinnell. Pp. 317-320, plate 30.
Nos. 8, 9, and 10 in one cover. February, 1910 ..... .15

11. Mammals of the 1908 Alexander Alaska Expedition, with Descriptions of the Localities Visited and Notes on the Flora of the Prince William Sound Region, by Edmund Heller. Pp. 321-360, plates 31-32.

12. Birds of the 1908 Alexander Alaska Expedition, with a Note on the Avifaunal Relationships of the Prince William Sound District, by Joseph Grinnell. Pp. 361-428, plates 33-34, 9 text-figures.
Nos. 11 and 12 in one cover. March, 1910 ..... $1.00
Index, pp. 429-440.

Vol. 6. 1. (XXIII) On the Weight of Developing Eggs. Part I, The Possible Significance of Such Investigations, by William E. Ritter; Part II, Practicability of the Determinations, by Samuel E. Bailey. Pp. 1-10. October, 1908 ..... .10

2. (XXIV) The Leptomedusae of the San Diego Region, by Harry Beal Torrey. Pp. 11-31, with text figures. February, 1909 ..... .20

3. (XXV) The Ophiurans of the San Diego Region, by J. F. McClendon. Pp. 33-64, plates 1-6. July, 1909 ..... .30

4. (XXVI) *Halocynthia johnsoni* n. sp.: A comprehensive inquiry as to the extent of law and order that prevails in a single animal species, by Wm. E. Ritter. Pp. 65-114, plates 7-14. November, 1909 ..... .50

5. (XXVII) Three Species of Cerianthus from Southern California, by H. B. Torrey and F. L. Kleeberger. Pp. 115-125, 4 text-figures. December, 1909 ..... .10

6. The Life History of *Trypanosoma dimorphon* Dutton & Todd, by Edward Hindle. Pp. 127-144, plates 15-17, 1 text-figure. December, 1909 ..... .50

7. (XXVIII) A Quantitative Study of the Development of the Salpa Chain in *Salpa fusiformis-runcinata*, by Myrtle Elizabeth Johnson. Pp. 145-176. March, 1910 ..... .35

8. A Revision of the Genus Ceratocorys, Based on Skeletal Morphology, by Charles Atwood Kofoid. Pp. 177-187. May, 1910 ..... .10

9. (XXIX) Preliminary Report on the Hydrographic Work Carried on by the Marine Biological Station of San Diego, by George F. McEwen. Pp. 189-204; text-figure and map. May, 1910 ..... .15

10. (XXX) Biological Studies on Corymorpha. III. Regeneration of Hydranth and Holdfast, by Harry Beal Torrey. Pp. 205-221; 16 text-figures.

11. (XXXI) Note on Geotropism in Corymorpha, by Harry Beal Torrey. Pp. 223-224; 1 text-figure.
Nos. 10 and 11 in one cover. August, 1910 ..... .20

12. The Cyclostomatous Bryozoa of the West Coast of North America, by Alice Robertson. Pp. 225-284; plates 18-25. December, 1910 ..... .60

13. Significance of White Markings in Birds of the Order Passeriformes, by Henry Chester Tracy. Pp. 285-312. December, 1910 ..... .25

14. (XXXIII) Third Report on the Copepoda of the San Diego Region, by Calvin Olin Esterly. Pp. 313-352; plates 26-32. February, 1911 ..... .40

15. The Genus *Gyrocotyle*, and Its Significance for Problems of Cestode Structure and Phylogeny, by Edna Earl Watson. Pp. 353-468; plates 33-48. June, 1911 ..... 1.00

Vol. 7. (Contributions from the Museum of Vertebrate Zoology.)

1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10
2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50
3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05
4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15
5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05
6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05
7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. Pp. 205-307. June, 1911 ..... 1.00
8. Description of a New Spotted Towhee from the Great Basin, by J. Grinnell. Pp. 309-311. August, 1911 ..... .05
9. Description of a New Hairy Woodpecker from Southeastern Alaska, by H. S. Swarth. Pp. 313-318. October, 1911 ..... .05
10. Field Notes on Amphibians, Reptiles and Birds of Northern Humboldt County, Nevada, with a Discussion of Some of the Faunal Features of the Region, by Walter P. Taylor. Pp. 319-436, plates 7-12. February, 1912 ..... 1.00

Vol. 8.

1. The Vertical Distribution of *Eucalanus elongatus* in the San Diego Region during 1909, by Calvin O. Esterly. Pp. 1-7. May, 1911..... .10
2. New and Rare Fishes from Southern California, by Edwin Chapin Starks and William M. Mann. Pp. 9-19, 2 text-figures. July, 1911 .10
3. Classification and Vertical Distribution of the Chaetognatha of the San Diego Region, Including Redescriptions of Some Doubtful Species of the Group, by Ellis L. Michael. Pp. 21-186, pls. 1-8. December, 1911 1.75
4. Dinoflagellata of the San Diego Region, IV. The Genus *Gonyaulax*, with Notes on Its Skeletal Morphology and a Discussion of Its Generic and Specific Characters, by Charles Atwood Kofoid. Pp. 187-286, plates 9-17.
5. On the Skeletal Morphology of *Gonyaulax catenata* (Levander), by Charles Atwood Kofoid. Pp. 287-294, plate 18.
6. Dinoflagellata of the San Diego Region, V. On *Spiraulax*, a New Genus of the Peridinida, by Charles Atwood Kofoid. Pp. 295-300, plate 19. Nos. 4, 5, and 6 in one cover. September, 1911 ..... 1.50
7. Notes on Some Cephalopods in the Collection of the University of California, by S. S. Berry. Pp. 301-310, plates 20-21. September, 1911 .10
8. On a Self-closing Plankton Net for Horizontal Towing, by Charles Atwood Kofoid. Pp. 311-348, plates 22-25.
9. On an Improved Form of Self-closing Water-bucket for Plankton Investigations, by Charles Atwood Kofoid. Pp. 349-352. Nos. 8 and 9 in one cover. November 18, 1911 ..... .40

Vol. 9.

1. The Horned Lizards of California and Nevada of the Genera *Phrynosoma* and *Anota*, by Harold C. Bryant. Pp. 1-84, pls. 1-9. December, 1911 ..... .75
2. On a Lymphoid Structure Lying Over the Myelencephalon of *Lepisosteus*, by Asa C. Chandler. Pp. 85-104, plates 10-12. December, 1911 .25

Vol. 10. (Contributions from the Museum of Vertebrate Zoology.)

1. Report on a Collection of Birds and Mammals from Vancouver Island, by Harry S. Swarth. Pp. 1-124, plates 1-4 ..... 1.00
2. A New Cony from the Vicinity of Mount Whitney, by Joseph Grinnell. Pp. 125-129. January, 1912 ..... .05

1824

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01257 4117